G-Series Systems

Installation and Commissioning Instructions

Raymarine®

Raymarine

G-Series System

Installation & Commissioning Instructions

Document Number:87070_1
Date: June 2007

Trademarks and registered trademarks

Autohelm, HSB, Raymarine, RayTech, Sail Pilot, SeaTalk and Sportpilot are registered trademarks of Raymarine Limited. Apelco is a registered trademark of Raymarine Holdings Limited (Registered in all major marketing territories).

AST, Autoadapt, Auto GST, Autoseastate, Autotrim, Bidata, Marine Intelligence, Maxiview, On Board, Raychart, Raynav, Raypilot, Raystar, ST40, ST60, Seaclutter, Smart Route, Tridata and Waypoint Navigation are trademarks of Raymarine Limited.

Maptech is a registered trademark of Maptech.

All other product names mentioned are trademarks or registered trademarks (if applicable) of their respective companies

© Raymarine plc 2007

Contents

Chapter 1: Introduction 11
- 1.1 Handbook information 12
- 1.2 Plan your installation 12
- 1.3 Install your system 12
- 1.4 Commissioning 13

Chapter 2: Typical systems 15

Chapter 3: Packs and contents 23
- 3.1 GPM400 processor 24
- 3.2 GVM400 video module 25
- 3.3 G-Series Keyboard 26
- 3.4 Keyboard wireless upgrade kit 27
- 3.5 SeaTalk^{ng} wireless basestation 28
- 3.6 Marine monitors 28
- 3.7 Alarm buzzer 29

Chapter 4: Cables and connections 31
- 4.1 General instructions 32
- 4.3 GPM400 processor 37
- 4.4 Monitor connections 38
- 4.5 Keyboard connections 40
- 4.6 Video and Entertainment 43
- 4.7 SeaTalk^{hs} network 47
- 4.8 GPS Connection 49
- 4.9 SeaTalk & Alarm connection 50
- 4.10 NMEA 0183 connections 51
- 4.11 SeaTalk^{ng} connections 54
- 4.12 NMEA 2000 connections 55

Chapter 5: Installation and mounting 57
- 5.1 General instructions 58
- 5.2 GPM400 Processor module 59
- 5.3 G-Series Keyboard 60
- 5.4 G-Series Monitors 65
- 5.5 GVM400 Video Module 66
- 5.6 Alarm buzzer 67

Chapter 6: Initial test 69
- 6.1 Power up test 70

Chapter 7: Initial Setup 73
- 7.1 Power up the system 74
- 7.2 First time configuration 74
- 7.3 Select Master GPM 75
- 7.4 Configure Nav Stations 77
- 7.5 Assign Keyboards 78

Chapter 8: Commissioning 81
- 8.1 Language setting 82
- 8.2 Compass heading setup 82
- 8.3 Radar setup 83
- 8.4 GPS checks 85
- 8.5 Fishfinder checks 86
- 8.6 Set up video 87
- 8.7 NMEA 0183 88
- 8.8 Data checks 89

Chapter 9: Troubleshooting 91
- 9.1 Troubleshooting 92

Appendix ATechnical specification..... 103

Appendix B - Nav Station schematic..... 109

Appendix C - Spares and accessories..... 117

Index 121

Warnings and cautions

Product installation

This equipment must be installed and operated in accordance with the Raymarine instructions provided. Failure to do so could result in poor product performance, personal injury, and/or damage to your boat.

Potential ignition sources

The equipment in these instructions is NOT approved for use in hazardous/flammable atmospheres such as an engine room.

Switch off power supply

Make sure you have set the boat's power supply to OFF before you start installing this product. Unless otherwise stated connect and disconnect equipment only with the power supply switched OFF.

High voltage

Equipment contains high voltages.
Unless otherwise instructed within these instructions do not remove the covers or attempt to access the internal components.

Grounding requirements

This display is not intended for use on "positive" ground boats. The power input cable earth screen connections must be connected directly to the boats ground.

Radar

The radar scanner transmits electromagnetic energy. Ensure all personnel are clear of the scanner before switching to Tx (transmit mode)

Navigation aid

Raymarine equipment is intended for use only as an aid to navigation. You must still ensure that a properly qualified person is acting as navigator at all times and that all applicable maritime regulations are adhered to. You must also ensure that all proper judgements and actions are taken to ensure a safe passage. Always maintain a permanent watch

Service and Maintenance

This product contains no user serviceable components. Please refer all maintenance and repair to authorized Raymarine dealers. Unauthorized repair may affect your warranty.

Sun covers

To provide protection against the damaging effects of ultra violet (UV) light, use the sun covers when equipment is not in use.

Cleaning

DO NOT use acid, ammonia based or abrasive products.
DO NOT use commercial high pressure washing (jet wash) equipment.

EMC installation guidelines

Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) regulations. This minimizes electromagnetic interference between equipment, which could otherwise affect the performance of your system.

Correct installation is required to ensure that EMC performance is not compromised.

For optimum EMC performance, we recommend that:

- Raymarine equipment and the cables connected to it are:

i. At least 3 ft. (1 m) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 7 ft. (2 m).
ii. More than 7 ft. (2 m) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.

- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.
- Raymarine specified cables are used.
- Cables are not cut or extended unless doing so is detailed in the installation manual.

Remember

Where constraints on the installation prevent any of the above recommendations:

- Always allow the maximum separation possible between different items of electrical equipment. This will provide the best conditions for EMC performance for the installation.

Suppression ferrites

Raymarine cables may be fitted with suppression ferrites. These are important for correct EMC performance. Any ferrite removed to facilitate installation must be replaced in the original position immediately installation is complete.

- Use only ferrites of the correct type, supplied by Raymarine authorized dealers.

Connections to other equipment

If Raymarine equipment is to be connected to other equipment using a cable not supplied by Raymarine, a Raymarine suppression ferrite MUST always be attached to the cable near the Raymarine unit.

Waste Electrical and Electronic Equipment Directive

The Waste Electrical and Electronic Equipment (WEEE) Directive requires the recycling of waste electrical and electronic equipment. Whilst the WEEE Directive does not apply to some of Raymarine's products, we support its policy and ask you to be aware of how to dispose of this product.

The crossed out wheeled bin symbol, illustrated above, and found on our products signifies that this product should not be disposed of in general waste or landfill.

Please contact your local dealer, national distributor or Raymarine Technical Services for information on product disposal.

Water ingress

As it exceeds the water proof rating capacity outlined by standards CFR46 / IPX7, subjecting any Raymarine equipment to commercial high pressure washing equipment may cause subsequent water intrusion and failure of the equipment. Raymarine will not warranty equipment subjected to high pressure washing

Warranty

To register your new Raymarine product, please take a few minutes to fill out the warranty card included in the box or go to:

www.raymarine.com

It is important that you complete the owner information and return the card to receive full warranty benefits, including notification of software updates if they are required.

Disclaimer

The technical and graphical information contained in this handbook, to the best of our knowledge, was correct as it went to press. However, our policy of continuous improvement and updating may change product specifications without prior notice. As a result, unavoidable differences between the product and handbook may occur from time to time. Raymarine cannot accept responsibility for any inaccuracies or omissions it may contain. For the latest product information visit our website - www.raymarine.com

Chapter 1: Introduction

1

This guide provides information to help you plan, install and commission your G-Series system.

Chapter contents

- 1.1 Handbook information on page 12.
- 1.2 Plan your installation on page 12.
- 1.3 Install your system on page 12.
- 1.4 Commissioning on page 13.

See also

You may require additional information when planning or installing your system.

- **Spares and accessories.**
  Lists of spares, accessories and cables can be found in Appendix C - Spares and accessories.
- **Raymarine handbooks and manuals.**
  All additional documents referred to in this manual can be downloaded from the Raymarine website. wwww.raymarine.com/handbooks.

1.1 Handbook information

This document is part of a series of books associated with the G-Series system

All documents can be downloaded from: www.raymarine.com/handbooks.

G-Series handbooks

Title	Part number
Installation and commissioning instructions	87070
Operating guide	86126
User reference guide	81276

Additional handbooks

You may also refer to separate instructions provided with the associated ancillary equipment.

1.2 Plan your installation

Prior to installing your G-Series system you will need to plan carefully. Use the information in this guide to assist you.

Tick	Planning for	Installation instructions
	Overall system	Chapter 2: Typical systems Chapter 3: Packs and contents
	Equipment location	Chapter 5: Installation and mounting
	Power, supply and distribution	Chapter 4: Cables and connections
	Connections and cables	Chapter 4: Cables and connections
	Nav Station details	Appendix B - Nav Station schematic
We strongly recommend that you produce a complete schematic diagram for your G-Series installation. See Appendix B - Nav Station schematic.		

1.3 Install your system

Once you have completed the planning stage, proceed with the installation:

Tick	Installation task	Installation instructions
	Ensure you have all required equipment, accessories and cables.	Chapter 3: Packs and contents Chapter 4: Cables and connections Appendix C - Spares and accessories
	Site all equipment.	Chapter 5: Installation and mounting
	Route all cables.	Chapter 4: Cables and connections
	Drill cable and mounting holes.	Chapter 5: Installation and mounting
	Make all connections into equipment.	Chapter 4: Cables and connections
	Power on test the system.	Chapter 6: Initial test
	Secure all equipment in place.	Chapter 5: Installation and mounting

1.4 Commissioning

Once you have completed the installation, proceed with the commissioning of the system:

Tick	Commissioning task	Installation instructions
	Assign master GPM	Chapter 7: Initial Setup
	Set up Nav Stations	Chapter 7: Initial Setup
	Assign keyboards	Chapter 7: Initial Setup
	Commission ancillary equipment	Chapter 8: Commissioning
	Complete warranty cards for equipment installed	Refer to separate warranty booklets supplied with equipment.

Chapter 2: Typical systems

2

This section provides an overview of typical G-Series systems and ancillary equipment.

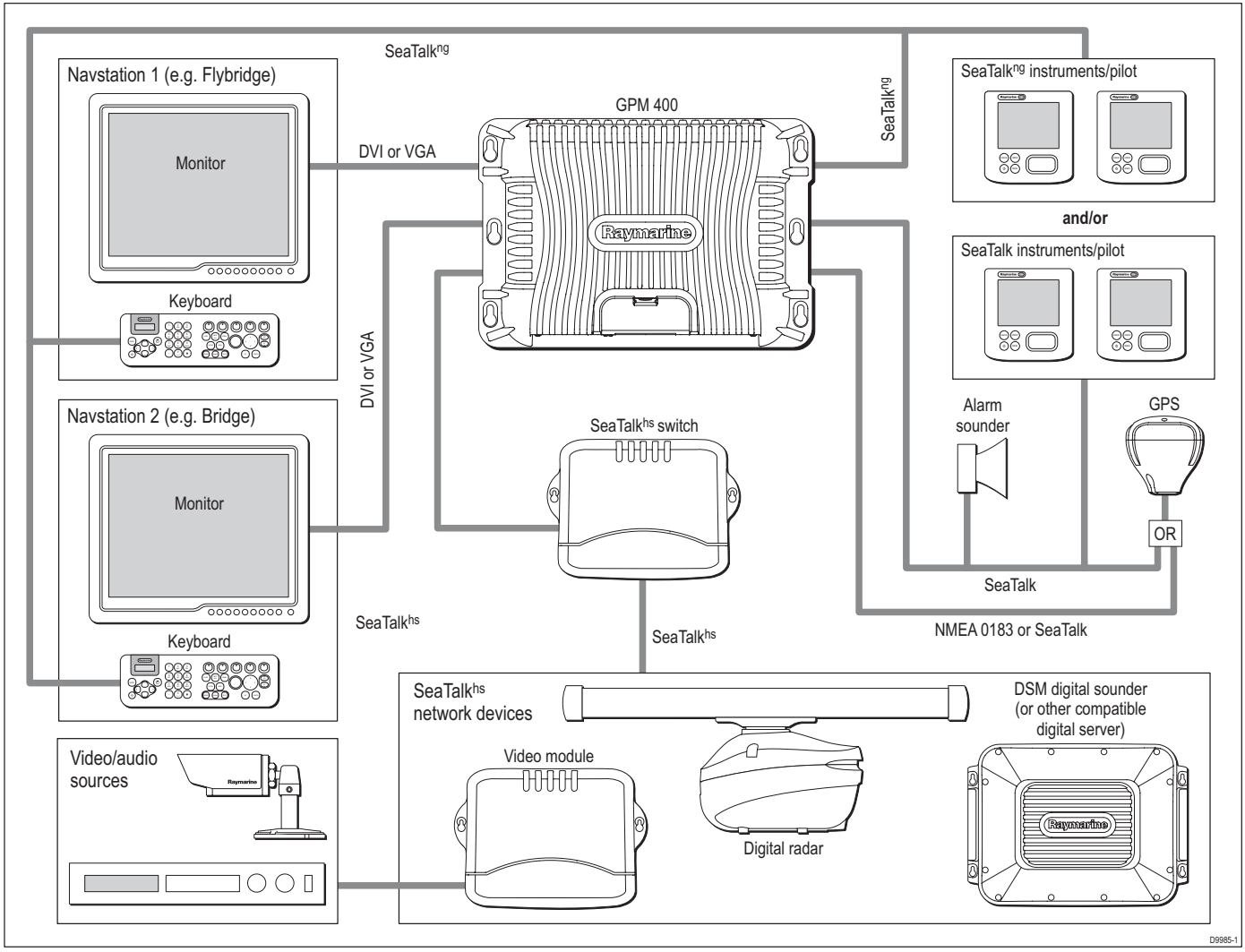
Chapter contents

- System overview on page 16
- Single processor system on page 17
- Dual Nav station (single processor) on page 18
- Network system, Single Nav station (Dual processor) on page 19
- Dual Nav station (Dual processor 2) on page 20
- Entertainment system on page 21
- System limits on page 22

See also

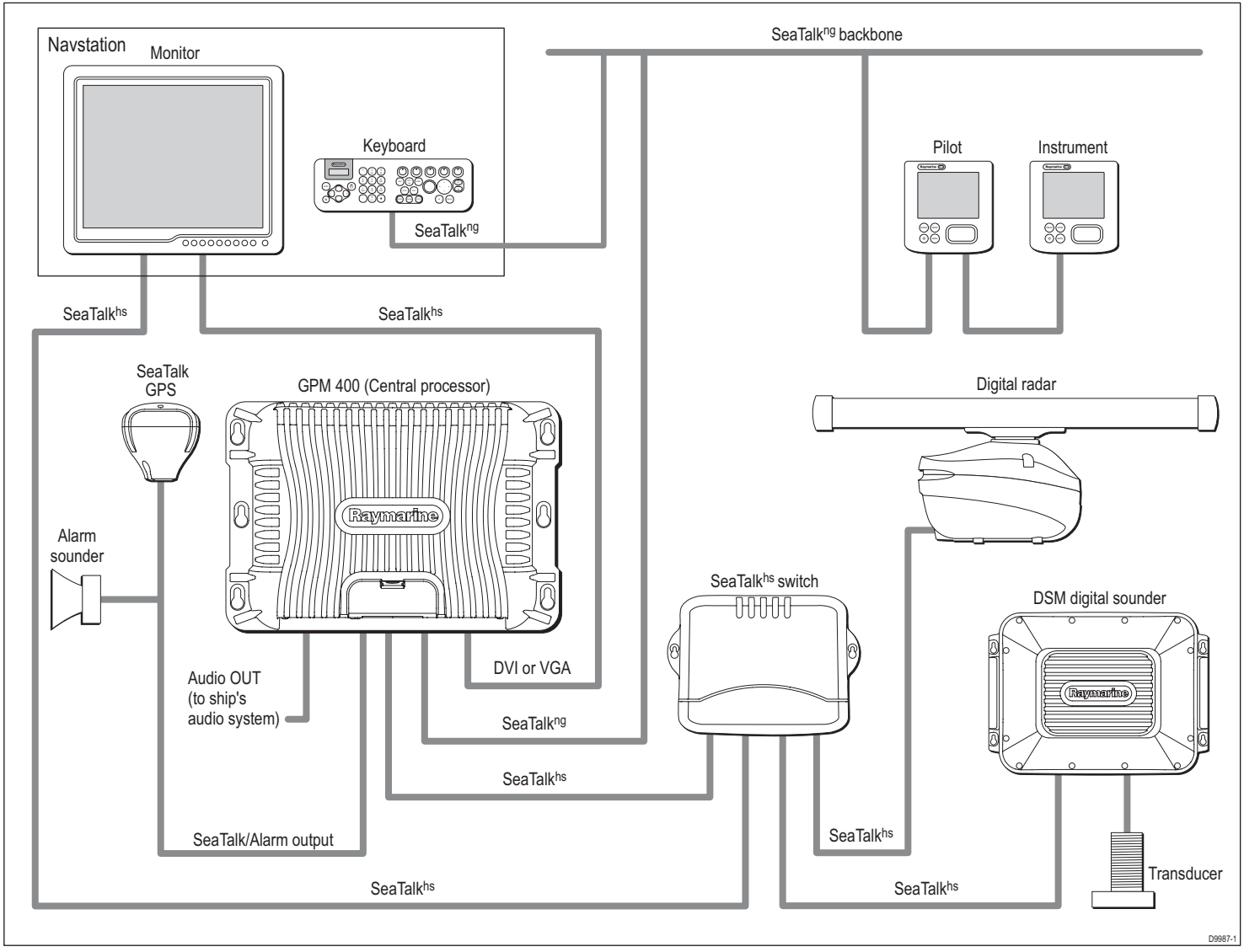
- Cables and connections on page 31

System overview

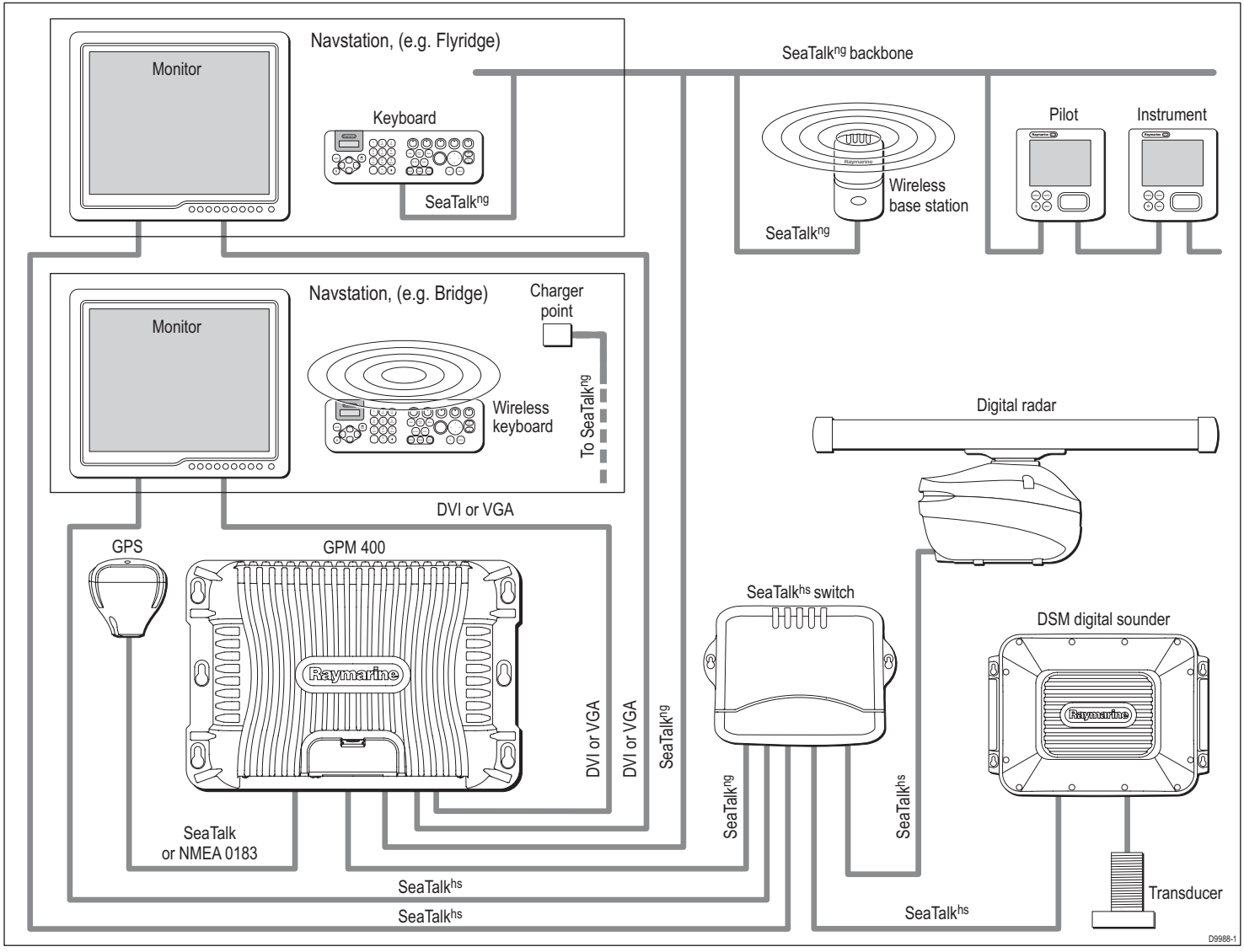


Note: Where 2 displays are connected to a single processor, both will display the same information.

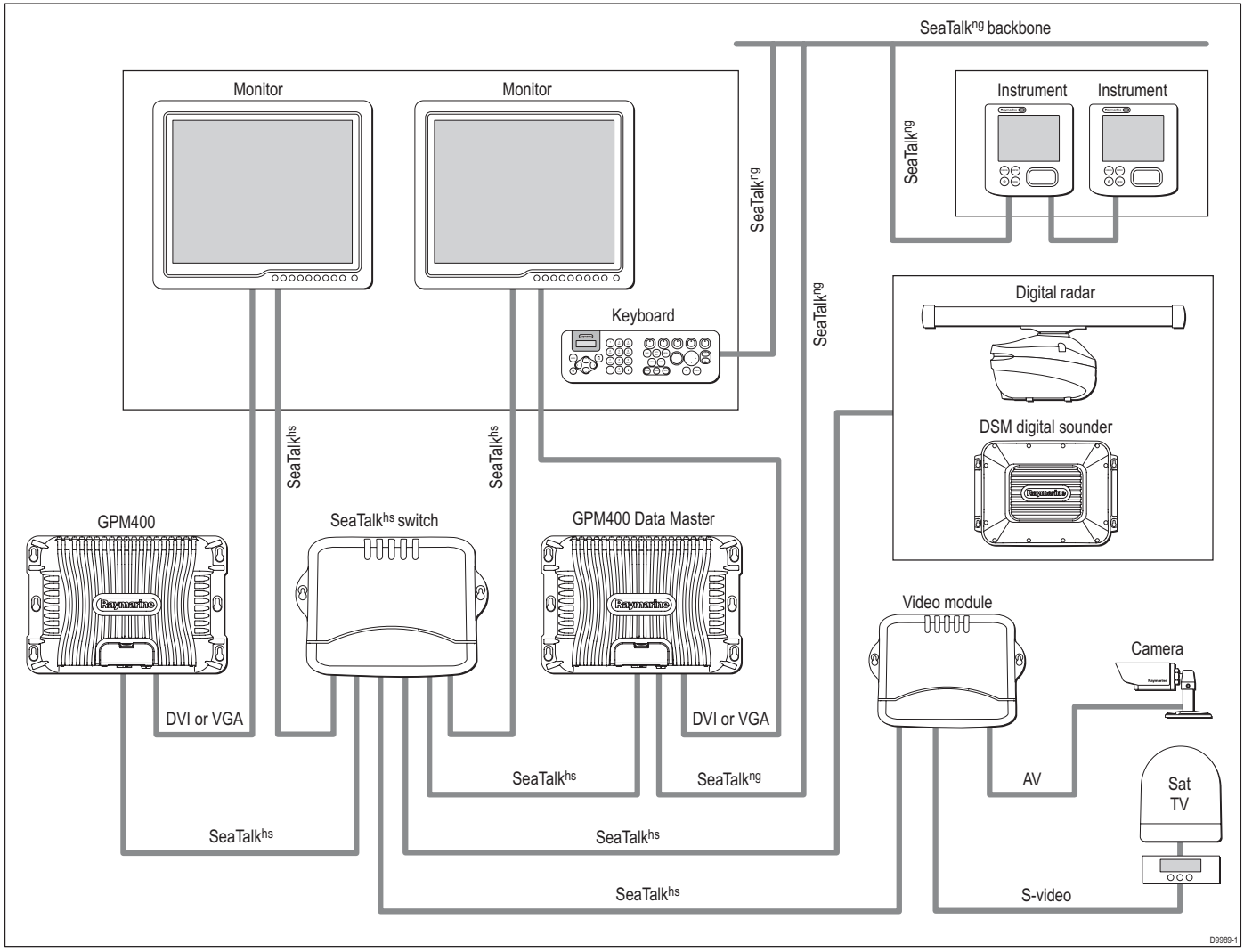
Single processor system



Dual Nav station (single processor)

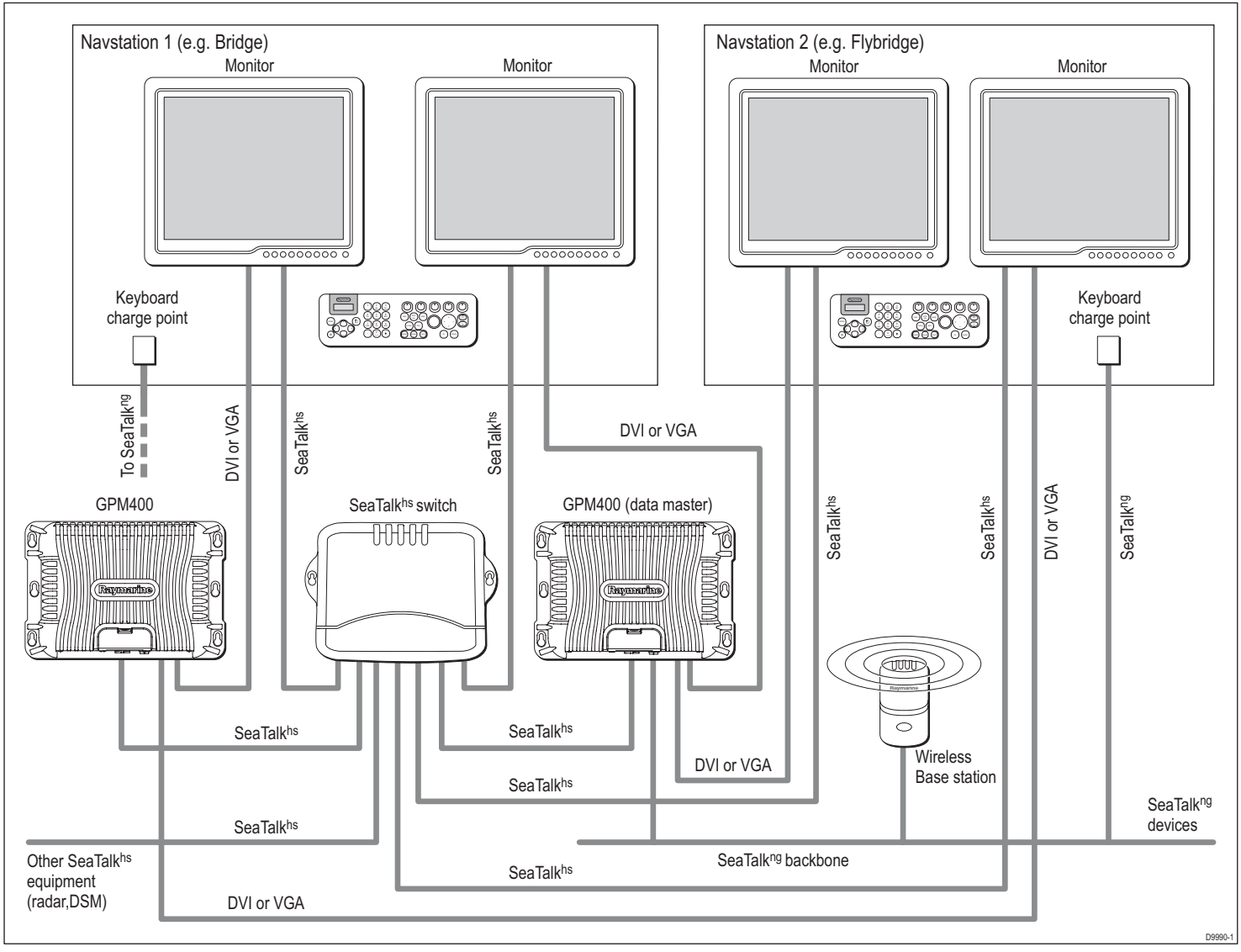


Network system, Single Nav station (Dual processor)

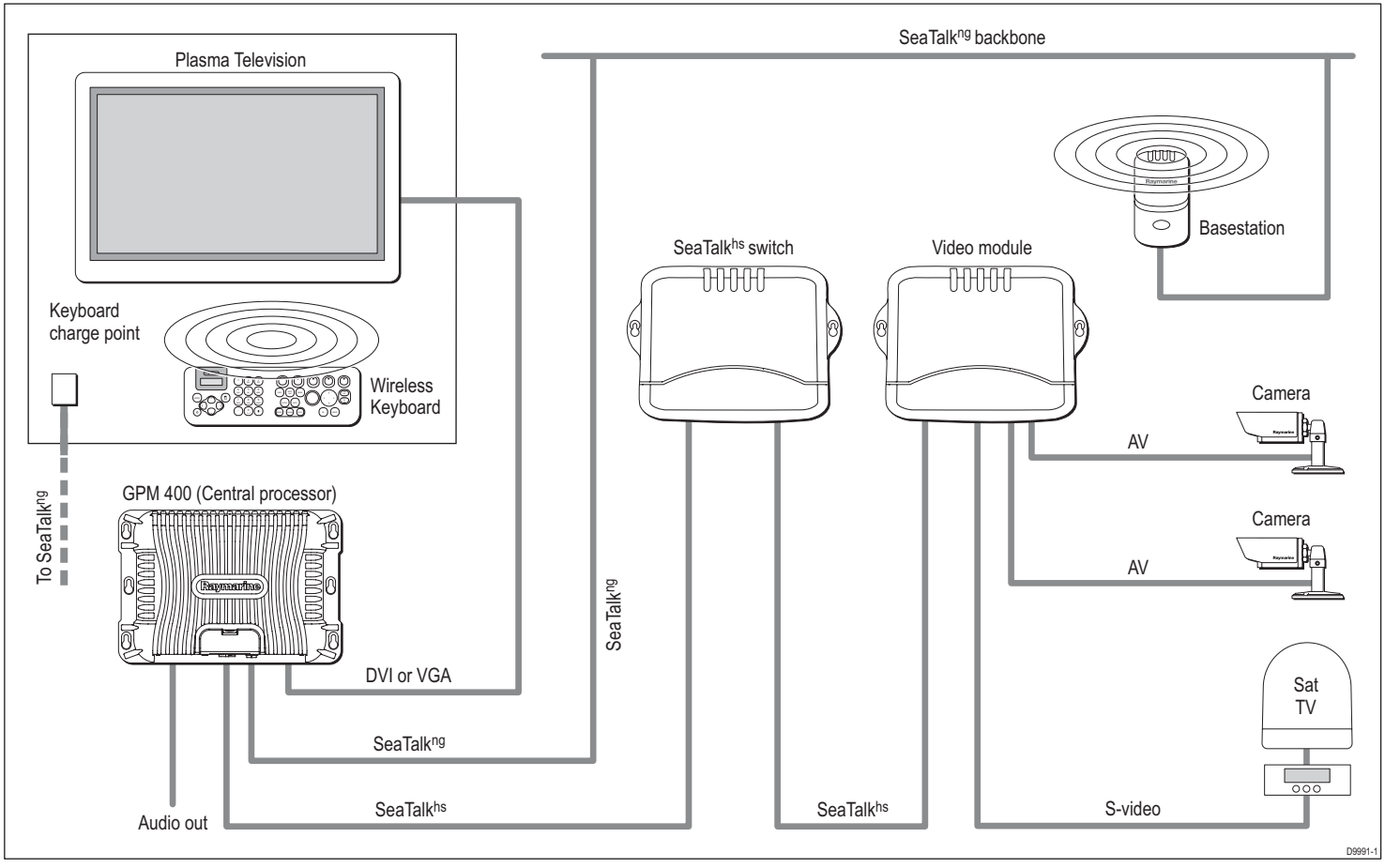


Note: Each display at a Nav station must be connected to a different GPM400. DIsplays sharing a GPM will both display identical information.

Dual Nav station (Dual processor 2)



Entertainment system



Note: The system may include up to 2 Video modules to provide additional video capacity.

System limits

The following quantities of G-Series components may be connected within a single system:

G-Series component	Max. number on system
GPM400 processor module	4 (of which 1 must be set as master GPM)
Monitors	8 (2 per GPM400 processor)
Keyboards	8
GVM400 video module	2
DSM digital sounder	1
Digital radar scanner	2

See also

For limitations associated with ancilliary components and systems, refer to the separate manufacturer's documentation.

Chapter 3: Packs and contents

This section contains details of pack contents for the G-Series system components.

3

Chapter contents

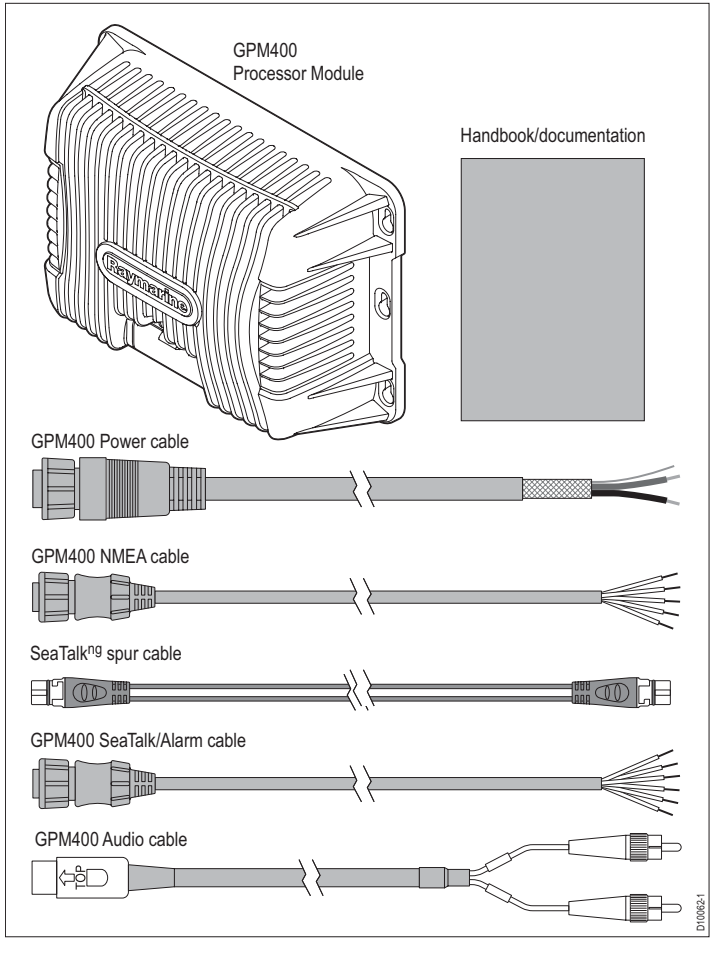
- 3.1 GPM400 processor on page 24
- 3.2 GVM400 video module on page 25
- 3.3 G-Series Keyboard on page 26
- 3.4 Keyboard wireless upgrade kit on page 27
- 3.5 SeaTalk^{ng} wireless basestation on page 28
- 3.6 Marine monitors on page 28
- 3.7 Alarm buzzer on page 29

See also

- For peripheral components (e.g. GPS antenna) refer to the separate instructions supplied with the equipment.

3.1 GPM400 processor

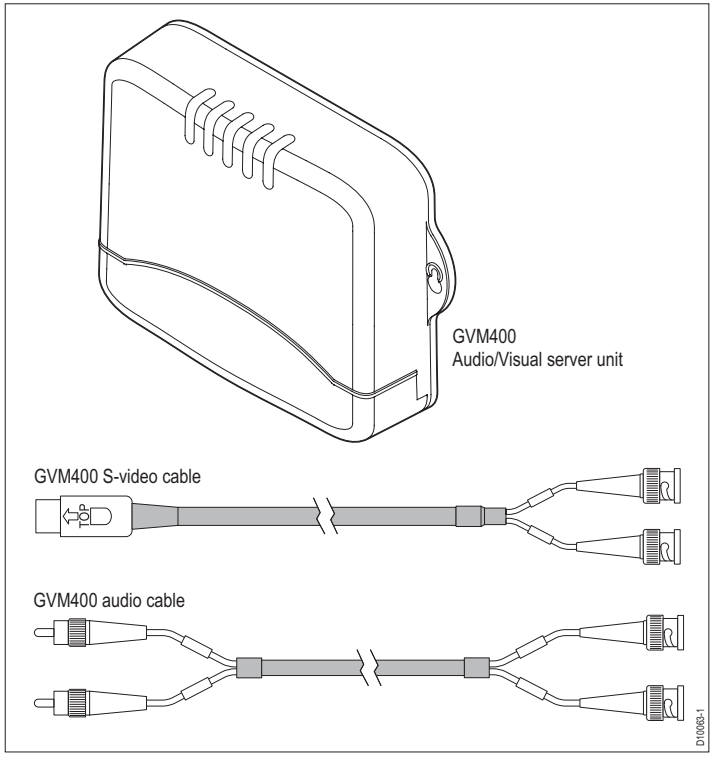
Pack items



Description	Part No.
GPM400 Processor module - US version GPM400 Processor module - EU version GPM400 Processor module - ROW version	E02042 E02047 E02048
1.5 m (4.9 ft) Power cable	R08003
1.5 m (4.9 ft) NMEA 0183 cable	R08004
1 m (3.3 ft) SeaTalk^{ng} spur cable	A06039
1.5 m (4.9 ft) SeaTalk/Alarm Out cable	E55054
3 m (9.8 ft) G-Series Audio out cable	R08266
Install pack	R08295
User documentation CD	47018
Commissioning and installation guide	87070
Quick reference guide	86126
Warranty booklet	80017

3.2 GVM400 video module

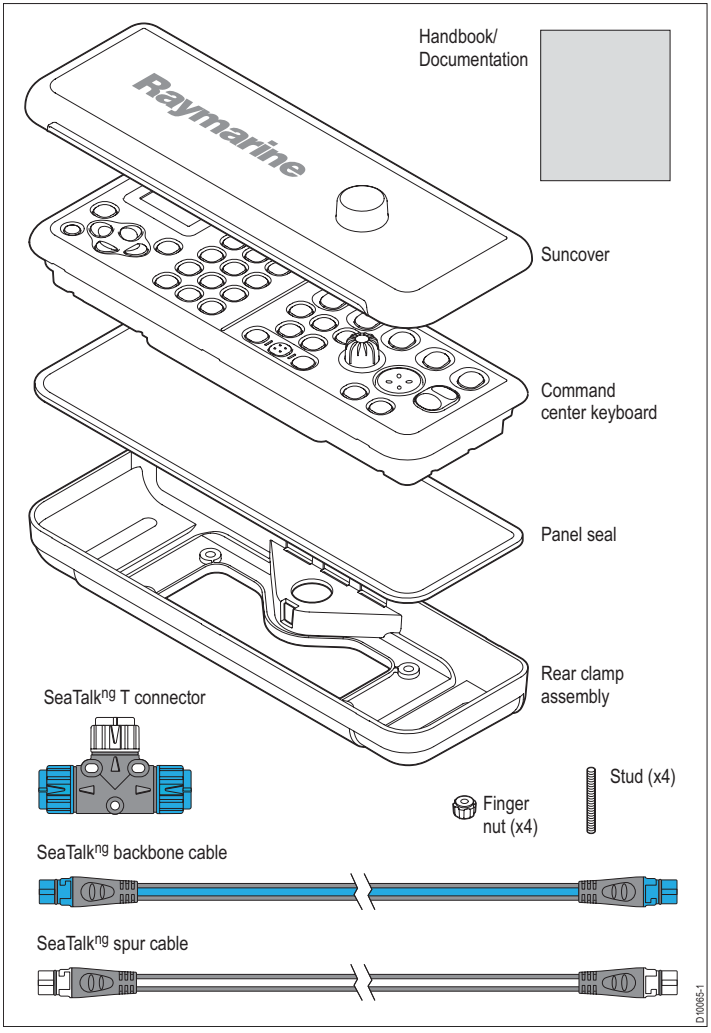
Pack items



Description	Part No.
GVM400 Video Module	E02043
1.5 m (4.9 ft) S-Video cable	R08274
1.5 m (4.9 ft) Audio cable	R08275
Install pack	R08318
Installation sheet	87068
Warranty booklet	80017

3.3 G-Series Keyboard

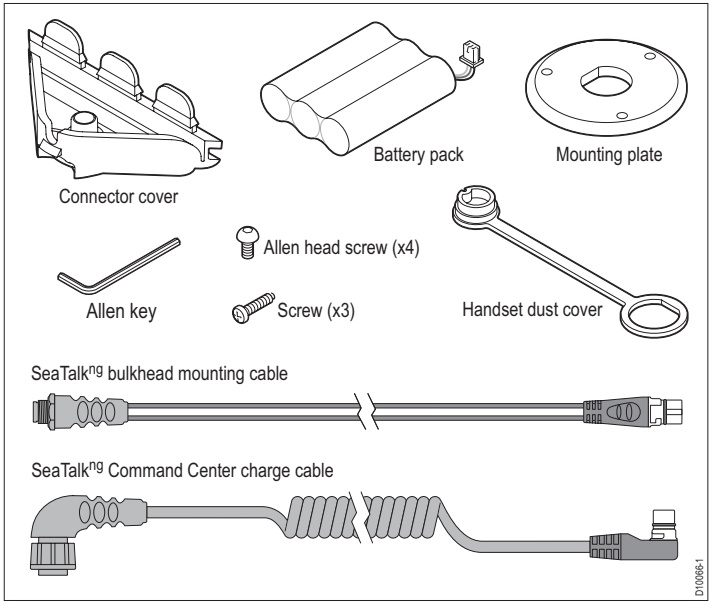
Pack items



Description	Part No.
G-Series command center keyboard	E02044
Sun cover	R08307
1 m (3.3 ft) SeaTalk^{ng}/NMEA2000 cable	A06039
400 mm (15.75 in) SeaTalk^{ng} backbone cable	A06033
SeaTalk^{ng} T-piece connector	A06028
Rear cover / mounting bracket	R08308
Screw pack	R08309
Installation sheet	87084
Warranty booklet	80017

3.4 Keyboard wireless upgrade kit

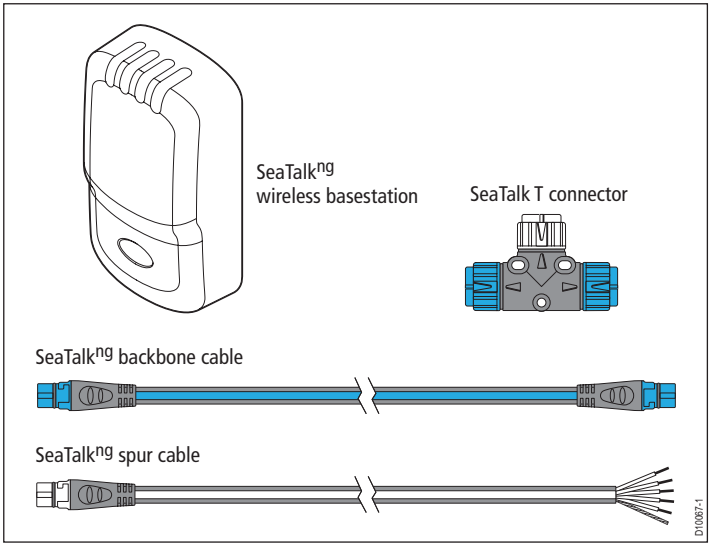
Pack items



Description	Part No.
SeaTalk^{ng} bulkhead mounting cable	R08311
2.5 m (8.2 ft) keyboard charge cable	R08310
Battery pack	R08312
4 x allen head M3 screws	R08313
Mounting plate	R08314
Connector cover	R08315
Mounting screws (self tapping) x 3	R08316
Dust cap (covers dash mount cnx)	R08317
Allen key	R08338
Installation Sheet	87085

3.5 SeaTalk^{ng} wireless basestation

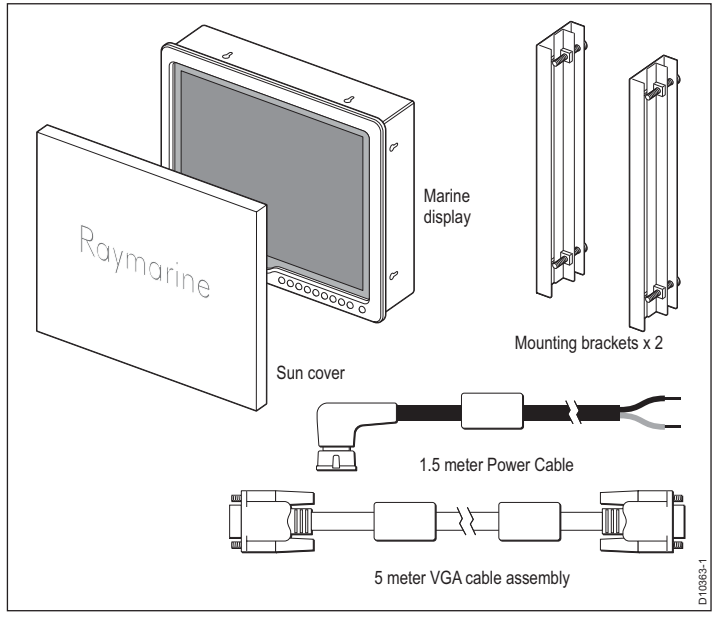
Pack items



Description	Part No.
Wireless basestation	E02045
1 m (3.3 ft) SeaTalk NG spur cable - stripped ends	A06043
400 mm (15.75 in) SeaTalk^{ng} backbone cable	A06033
SeaTalk NG T-connector	A06028
Installation instructions	87086

3.6 Marine monitors

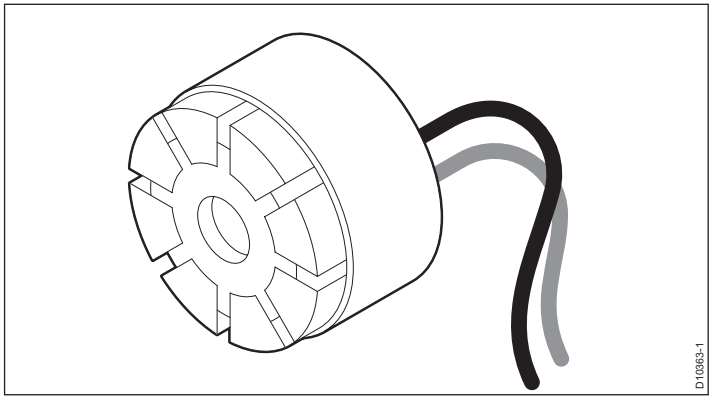
Pack items



Description	Part No.
17" Marine Display 19" Marine Display	E02036 E02037
Sun cover	Part numbers depend on the display model. Refer to your display handbook for details
2 x mounting brackets	
5 m (16.4 ft) VGA cable	
1.5 m (4.9 ft) Power cable	

3.7 Alarm buzzer

Pack items



Description	Part No.
Alarm buzzer	E26033

Chapter 4: Cables and connections

4

This section contains details of cables and connections. Use it to plan your system wiring and ensure that you have the necessary cables available.

Chapter contents

- 4.1 General instructions on page 32
- 4.2 Power distribution on page 33
- 4.3 GPM400 processor on page 37
- 4.4 Monitor connections on page 38
- 4.5 Keyboard connections on page 40
- 4.6 Video and Entertainment on page 43
- 4.7 SeaTalk^{hs} network on page 47
- 4.8 GPS Connection on page 49
- 4.9 SeaTalk & Alarm connection on page 50
- 4.10 NMEA 0183 connections on page 51
- 4.11 SeaTalk^{ng} connections on page 54
- 4.12 NMEA 2000 connections on page 55

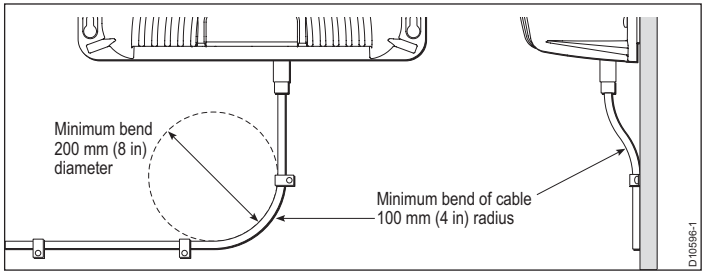
4.1 General instructions

Cable types and length

- Follow the guidelines given in this section to determine appropriate cable types and length.
- Unless otherwise stated use only standard cables of the correct type, supplied by Raymarine.
- Ensure that any non-Raymarine cables are of the correct quality and gauge. For example, longer power cable runs may require larger wire gauges to minimize any voltage drop in a cable.

Routing cables

- No acute bends. Minimum bend radius of 100mm.



- Protect all cables from physical damage and exposure to heat. Use trunking or conduit where possible. Avoid running cables through bilges or doorways, or close to moving or hot objects.
- Secure cables in place using tie-wraps or lacing twine. Coil any extra cable and tie it out of the way.
- Where a cable passes through an exposed bulkhead or deckhead, a watertight feed-through should be used.

You should always route data cables:

- as far apart from other equipment and cables as possible,
- as far away from high current carrying AC and DC power lines as possible,
- as far away from antennas as possible.

Strain relief

- Ensure adequate strain relief is provided. Protect connectors from strain and ensure they will not pull out under extreme sea conditions.

Circuit isolation

For installations using both AC and DC current:

- Always use isolating transformers or a separate power-inverter to run PC's, processors, displays and other sensitive electronic instruments or devices.
- Always use an isolating transformer with Weather FAX audio cables.
- Always use and RS232/NMEA converter with optical isolation on the signal lines.
- Always make sure that PC's or other sensitive electronic devices have a dedicated power circuit.

Cable shielding

Ensure that all data cables are properly shielded that the cable shielding is intact (e.g. hasn't been scraped off by being squeezed through a tight area).

Schematic diagram

When planning your connections and cabling, produce a schematic diagram to assist you.

EMC installation guidelines

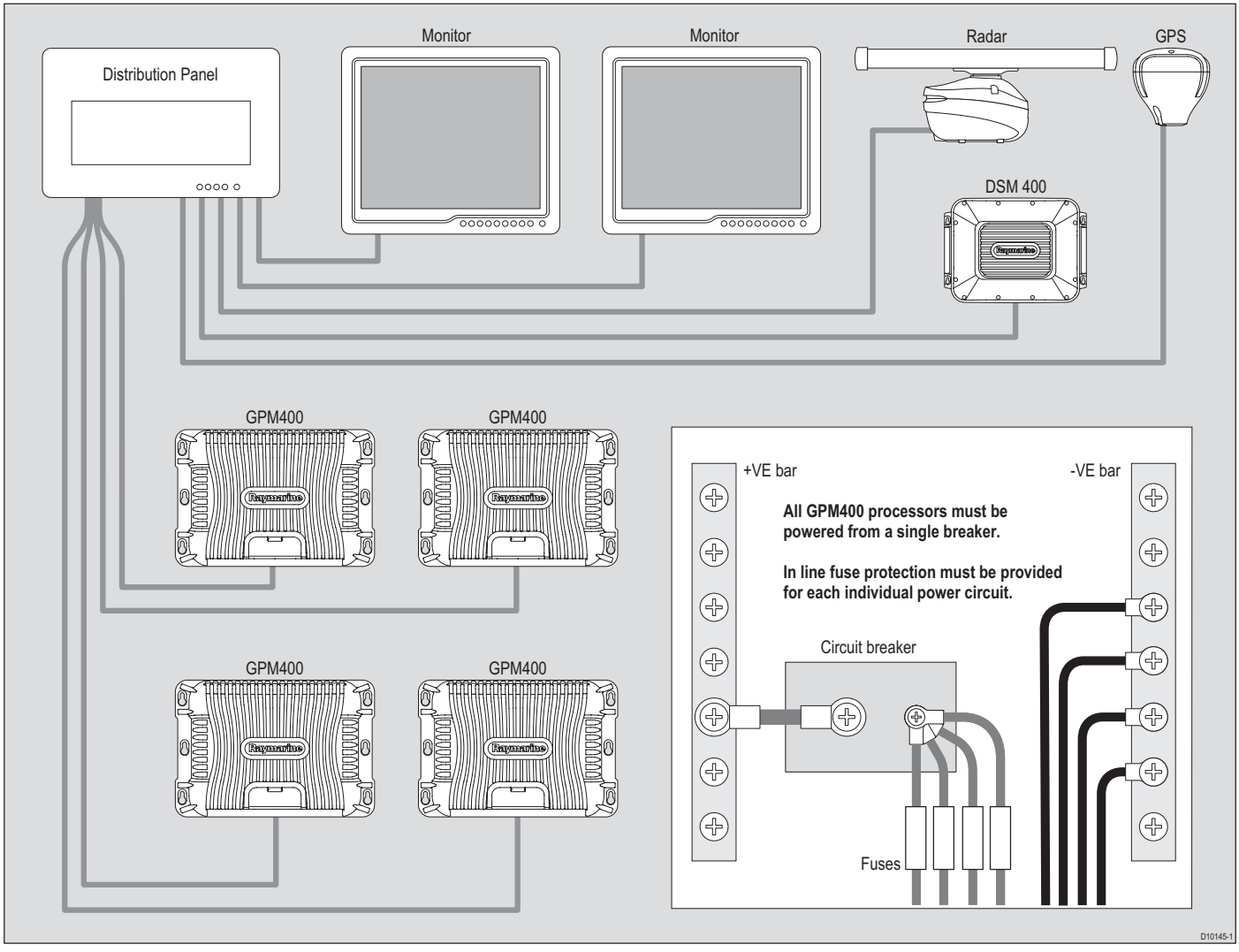
Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) regulations. This minimizes electromagnetic interference between equipment, which could otherwise affect the performance of your system.

Correct installation is required to ensure that EMC performance is not compromised.

Ensure you comply with the EMC guidelines detailed on *page 58*

4.2 Power distribution

Typical distribution

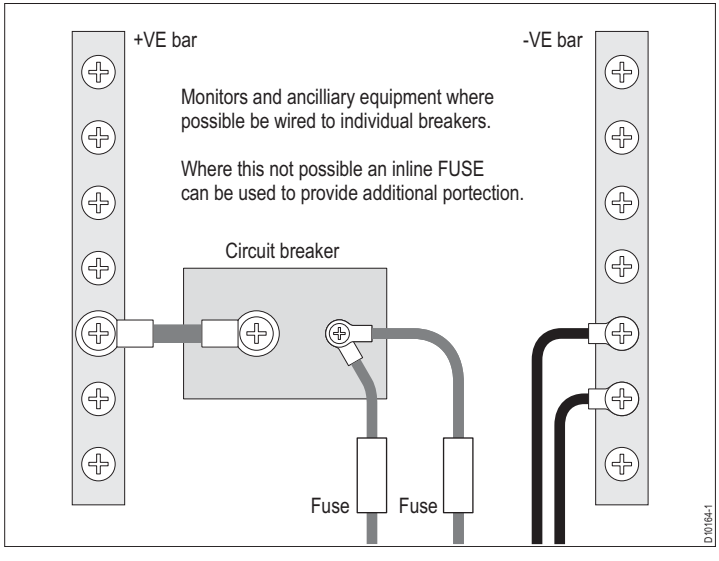


Power distribution notes:

- Raymarine recommend that you have a dedicated distribution panel for your G-Series system.
- All GPM400 processor units must be powered from a single breaker or switch, with appropriate circuit protection.
- All monitors and ancillary equipment should where possible be wired to individual breakers.

Sharing a breaker

Where more than 1 piece of equipment shares a breaker you must provide protection for the individual circuits. E.g. an in-line fuse for each power circuit


+VE bar
-VE bar
Monitors and ancilliary equipment where possible be wired to individual breakers.
Where this not possible an inline FUSE can be used to provide additional portection.
Circuit breaker
Fuse
Fuse
D10164-1

The fuse must be of an appropriate type and rating for the load to be protected.

Circuit grounding

Grounding

The power cable screen and all Ground terminals MUST be connected to ship's ground. Failure to connect to ship's ground may cause it, or other on-board electronics to function incorrectly.

No positive ground

The G-Series system is NOT intended for use on "positive" ground boats. The power input cable earth screen connections must be connected directly to the boats ground.

No ground loops

Ground loops may cause galvanic corrosion. Avoid using the ships structure (metal) as an earth point, as this could result in ground loops.

Grounding notes

- Use a dedicated earthing plate (e.g. dynaplate) in contact with the water.
- Ground cables may be routed to a common point (e.g. within the switch panel. With a single (appropriately rated) copper braid connecting to the earthing plate.
- Use flat tinned copper braid, 30 A rating (1/4 inch) or greater. Equivalent stranded wire diameter 4mm or greater.
- Keep the length of the earth braid as short as possible.
- Installations using both AC and DC current should have a separate ground circuit for each. See Circuit isolation on page 32.

Circuit protection

GPM400 processor

All GPM400 processors must be switched via a single breaker.

Number of GPM400 units	Supply voltage	Thermal breaker (Overall)	Fuse (Individual)
1	12 V	10 A	10 A
	24 V	5 A	5 A
2	12 V	20 A	10 A
	24 V	10 A	5 A
3	12 V	25 A	10 A
	24 V	15 A	5 A
4	12 V	35 A	10 A
	24 V	20 A	5 A

General circuit protection

The following loads and protection ratings apply to G-Series displays and ancillary equipment:

Equipment	Supply voltage	Thermal breaker	Fuse
G190 marine display	12 V	8 A	12 A
	24 V	4 A	6 A
G170 marine display	12 V	8 A	12 A
	24 V	4 A	6 A
GVM400 Video Module	12 V	1.2 A	2 A
	24 V	1 A	1 A

For other ancillary equipment, refer to the separate installation instructions for circuit loading and protection information.

Power cables

- Cable must be of a suitable gauge for the circuit load.
- Each unit should have its own dedicated power cable wired back to the distribution panel.
- All GPM400 processors should be connected to the same breaker.
- Power cable must include a separate screen wire.

GPM400 power cables

Length (max)	Supply voltage	Cable gauge (AWG)
0-5 m (0-16.4 ft)	12 V	18
	24 V	20
5-10 m (16.4-32.8 ft)	12 V	14
	24 V	18
10-15 m (32.8-49.2 ft)	12 V	12
	24 V	16
15-20 m (49.2-65.6 ft)	12 V	12
	24 V	14

Each unit should have its own dedicated power cable wired back to the distribution panel.
All GPM400 processors should be connected to the same breaker.
Power cable must include a separate screen.

GVM400 Video Module power cables

Length (max)	Supply voltage	Cable gauge (AWG)
0-5 m (0-16.4 ft)	12 V	20
	24 V	20
5-10 m (16.4-32.8 ft)	12 V	20
	24 V	20
10-15 m (32.8-49.2 ft)	12 V	20
	24 V	20
15-20 m (49.2-65.6 ft)	12 V	18
	24 V	20

The GVM400 should have its own dedicated power cable wired back to the distribution panel.
Power cable must include a separate screen.

G170/G190 Marine monitor power cables:

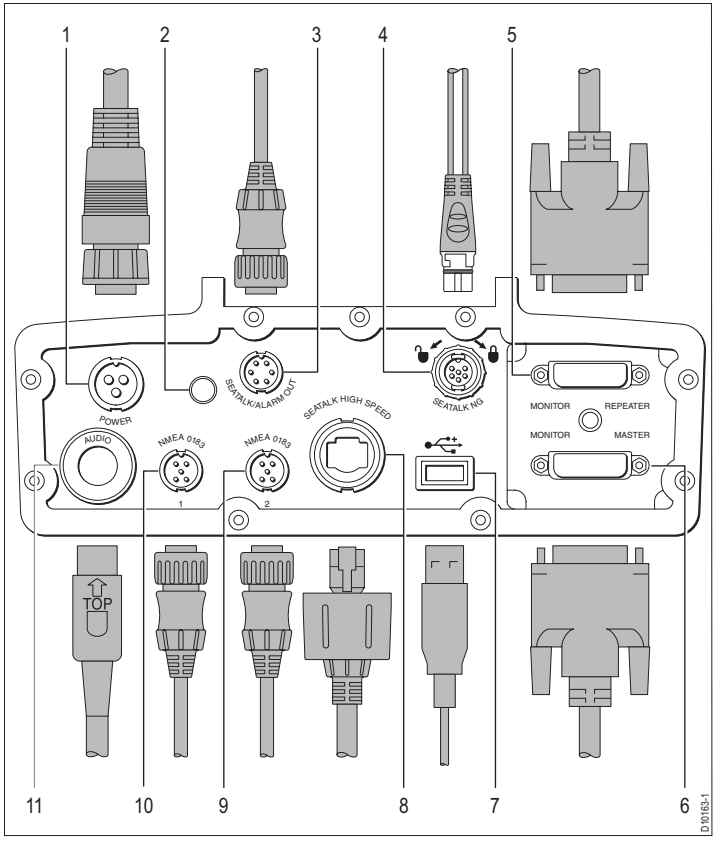
Length (max)	Supply voltage	Cable gauge (AWG)
0-5 m (0-16.4 ft)	12 V	12
	24 V	12
5-10 m (16.4-32.8 ft)	12 V	9
	24 V	9
10-15 m (32.8-49.2 ft)	12 V	7
	24 V	7
15-20 m (49.2-65.6 ft)	12 V	6
	24 V	6

Monitor connection notes:

- Each monitor should have its own dedicated power cable.
- Equipment which is susceptible to noise (such as VHF radios) should not be wired to the same distribution panel as the monitors. If in doubt the monitors (or affected equipment) can be wired directly back to the battery/power source via a dedicated breaker.
  Refer to the separate monitor documentation for more details.

4.3 GPM400 processor

The GPM400 has the following connections:



1. 12/24V Power in (see *page 33*)
2. Status LED (see *page 99*)
3. SeaTalk / Alarm output (see *page 50*)
4. SeaTalk^{ng} connection (see *page 54*)
5. DVI display connection - repeater (see *page 38*)
6. DVI display connection - master (see *page 38*)
7. USB connection (for chart and software upgrade only)
8. SeaTalk^{hs} network connection (see *page 47*).
9. NMEA 0183 connection (see *page 51*)
10. NMEA 0183 connection (see *page 51*)
11. Audio output (see *page 46*)

Maximum quantity of GPM400 units

The G-Series system will support up to 4 GPM400 processors, of which 1 must be set as the Master GPM.

Master GPM

On a system with more than one GPM400 you must designate one them as a Master GPM. The SeaTalk and SeaTalk^{ng} bus must be connected to the Master GPM.

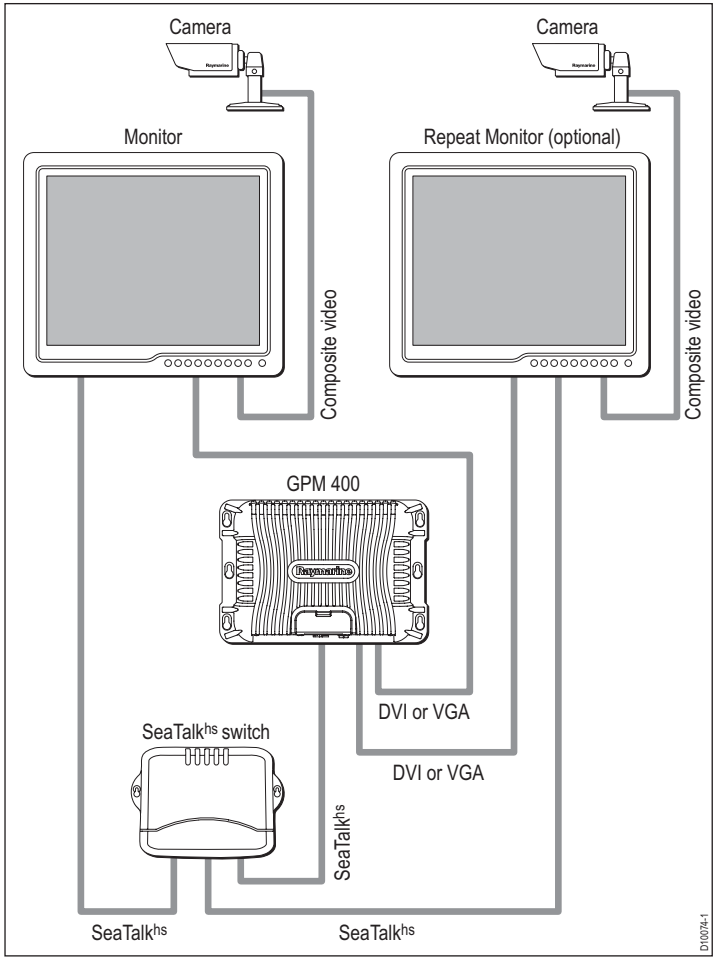
Note: The data is passed between multiple GPMs using the SeaTalk^{hs} network.

See also

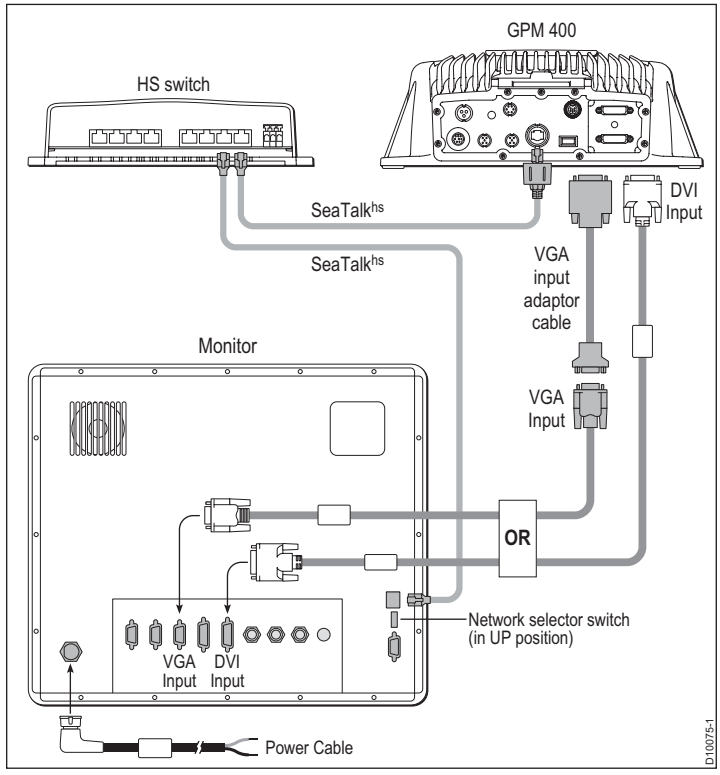
- Ensure you record connections to the GPM400 on the schematic diagram. See Appendix B - Nav Station schematic .
- For a typical SeaTalk^{hs} system see *page 19*.
- For information on SeaTalk^{hs} cables and connections see *page 47*.

4.4 Monitor connections

Connect the G-Series marine displays to both the GPM400 processor and SeaTalk^{hs} switch.



Monitors may be connected to the GPM400 using either VGA or DVI cable.



Repeat displays

Repeat displays (if used) show the same information / page as the master display. For this reason each display within a Nav Station must be connected to a different GPM400.

Note: During start-up only the master display will show the boot sequence and start-up information.

Maximum quantity of monitors

The G-Series system will support up to 8 monitors (2 per GPM400).

Screen resolution and aspect ratio

Each GPM will output the same screen resolution to all connected displays.

Therefore where multiple displays are connected to a single GPM they should have the same aspect ratio and screen resolution. For example we recommend that wide screen televisions and standard displays are connected to separate GPMs.

IP Address

When connecting a display to the processor, note its IP address on your system diagram. You will need to refer to this during the commissioning process. (See *Appendix B* for sample diagrams.)

Selector Switch

Raymarine G-Series displays have a selector switch located by the SeaTalk^{hs} connector. This must be in the UP position for connection to the SeaTalk^{hs} network.

3rd party displays

Ensure that any 3rd party (non-Raymarine) displays have electrical isolation between the video connections and power supply (and any other 0 V referenced connection). This is to avoid 0 V loops which can cause interference issues.

Marine display cables

The following cables can be used with marine displays:

Cable	Part No	Notes
DVI Connection		To ensure optimum signal quality use only Raymarine cables.
5 m (16.4 ft) DVI to DVI (digital) cable	E06021	
10 m (32.8 ft) DVI to DVI (digital) cable	E06022	
VGA		To ensure optimum signal quality use only Raymarine cables.
500 mm (19.69 in) DVI-VGA converter	E06053	Required for any VGA connection to the GPM400.
1.5 m (4.9 ft) VGA cable	R08130	
5 m (16.4 ft) VGA cable	R08174	Supplied with Raymarine G-Series Marine Displays.
10 m (32.8 ft) VGA cable	R08296	
20 m (65.6 ft) VGA cable	R08297	
Display to SeaTalk^{hs}		Required for keyboard control of display functions.
1.5 m (4.9 ft) SeaTalk^{hs} cable	E55049	
5 m (16.4 ft) SeaTalk^{hs} cable	E55050	
10 m (32.8 ft) SeaTalk^{hs} cable	E55051	
20 m (65.6 ft) SeaTalk^{hs} cable	E55052	
Power		
1.5 m (4.9 ft) Power cable	R08173	Supplied with product

Cable	Part No	Notes
Power cable extension	Not supplied	You may extend the power cable if required. See *page 35*.

See *Appendix C* for other cables and accessories.

See also

- For more detailed installation information refer to the separate users guide supplied with the display.
- Ensure you record connections to the GPM400 on the schematic diagram. See Appendix B - Nav Station schematic .

4.5 Keyboard connections

The G-Series Keyboard communicates using the SeaTalk^{ng} system. It may be connected directly to the backbone (wired) or use a remote basestation (wireless).

Note: You should have at least one permanently wired keyboard. In the event that any wireless keyboards are lost, the wired keyboard can be used to control the system.

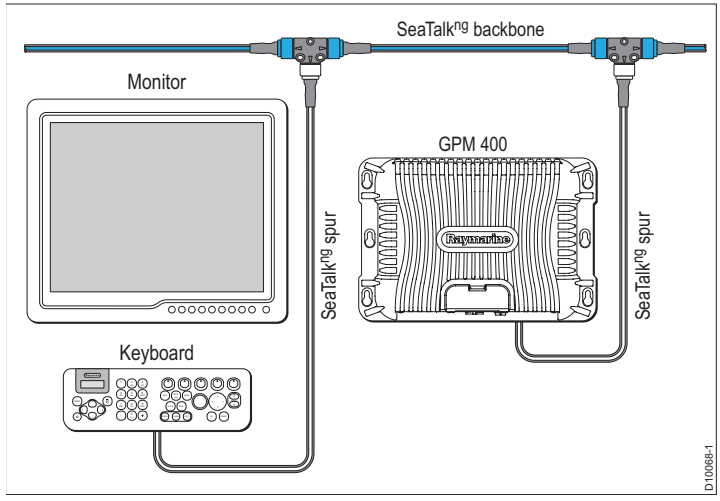
Maximum quantity of Keyboards

The G-Series system will support up to 8 keyboards.

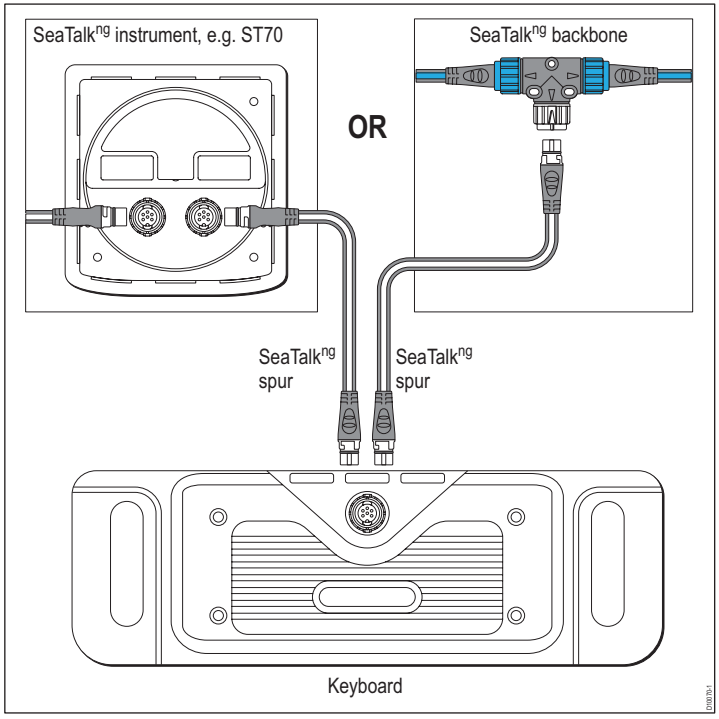
Schematic diagram

When connecting a keyboard to the system, record its details on your system/schematic diagram. You will need this information during commissioning. (See *Appendix B* for sample diagrams.)

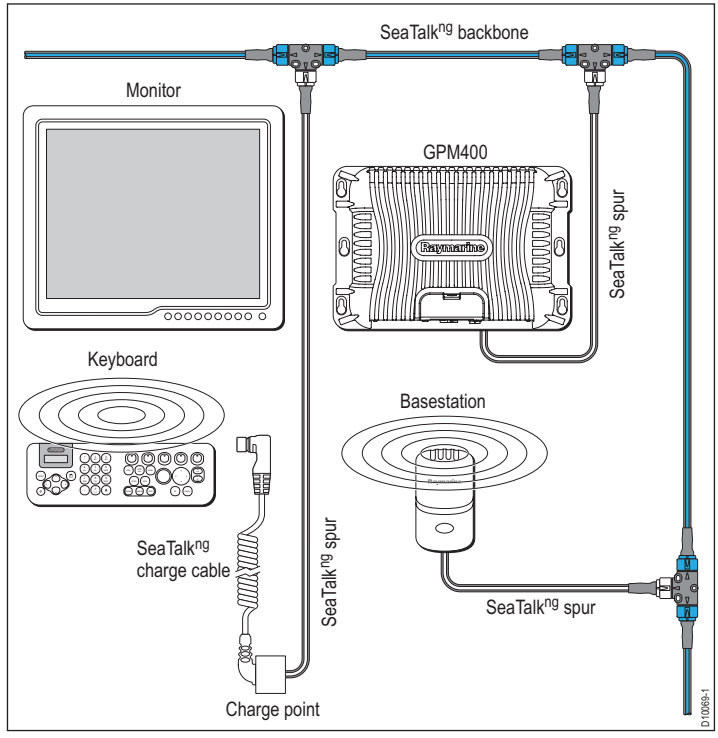
Wired keyboard system



Wired keyboard connection details

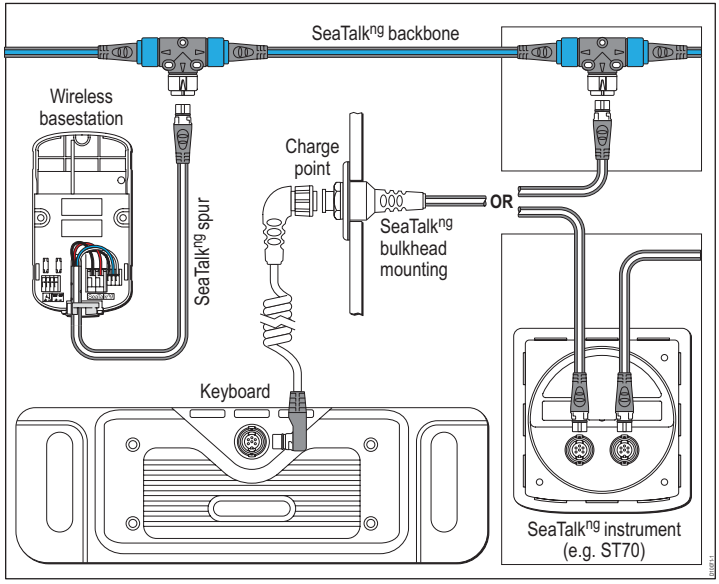


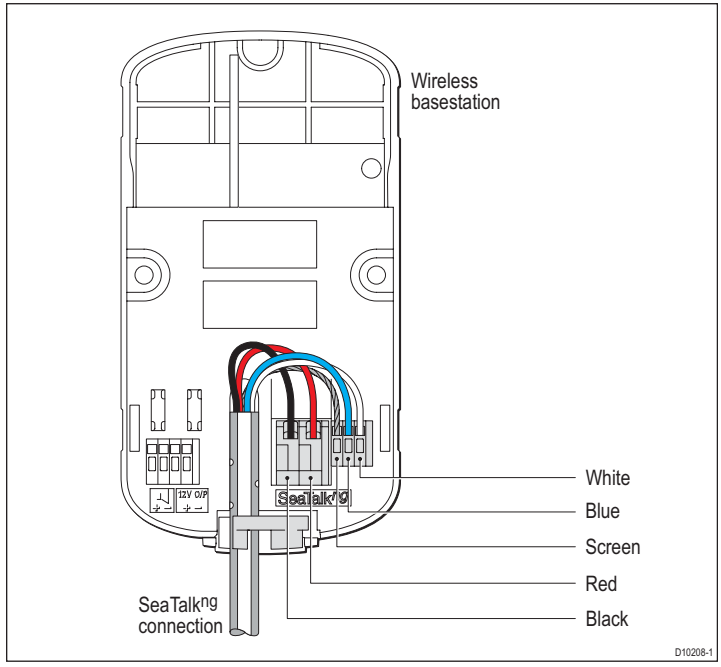
Wireless keyboard system



For cable part numbers see *page 42*.

Wireless keyboard connection details





Keyboard cables

The following cables can be used with the Keyboard:

Cable	Part No	Notes
Keyboard to SeaTalkng		
400 mm (15.75 in) SeaTalkng spur cable	A06038	
1 m (3.3 ft) SeaTalkng spur cable*	A06039*	Suppled with the keyboard
3 m (9.8 ft) SeaTalkng spur cable	A06040	

Cable	Part No	Notes
5 m (16.4 ft) SeaTalk^{ng} spur cable	A06041	
Wireless basestation to SeaTalk^{ng}		
1 m (3.3 ft) SeaTalk^{ng} spur cable (bare ends)	A06043	Included with wireless basestation.
3 m (9.8 ft) SeaTalk^{ng} spur cable (bare ends)	A06044	
Dashboard / Charging		
2.5 m (8.2 ft) charging cable	R08311	Included with the wireless upgrade kit.
3 m (9.8 ft) SeaTalk^{ng} bulkhead mounting cable	R08310	
See *Appendix C* for other cables and accessories.		

See also

Ensure you record connections to the GPM400 on the schematic diagram. See Appendix B - Nav Station schematic .

4.6 Video and Entertainment

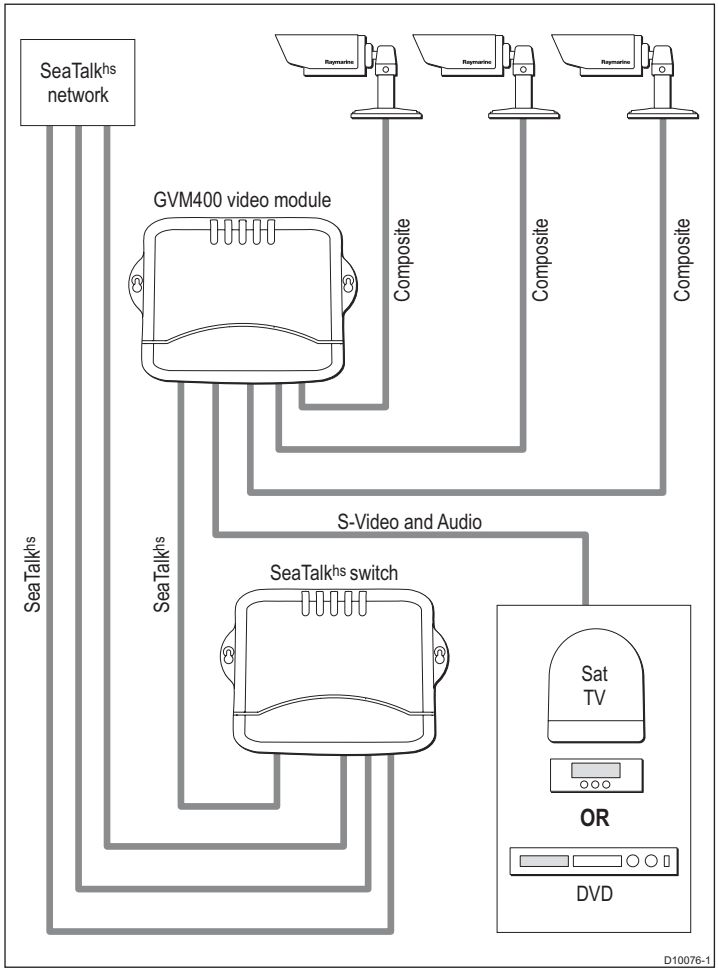
Video and entertainment is connected and distributed to the

G-Series system using 2 system components:

- GVM400 Video Module
- SeaTalk^{hs} switch.

Note: Video equipment may also be connected directly into the displays, although this will not be distributed around the system.

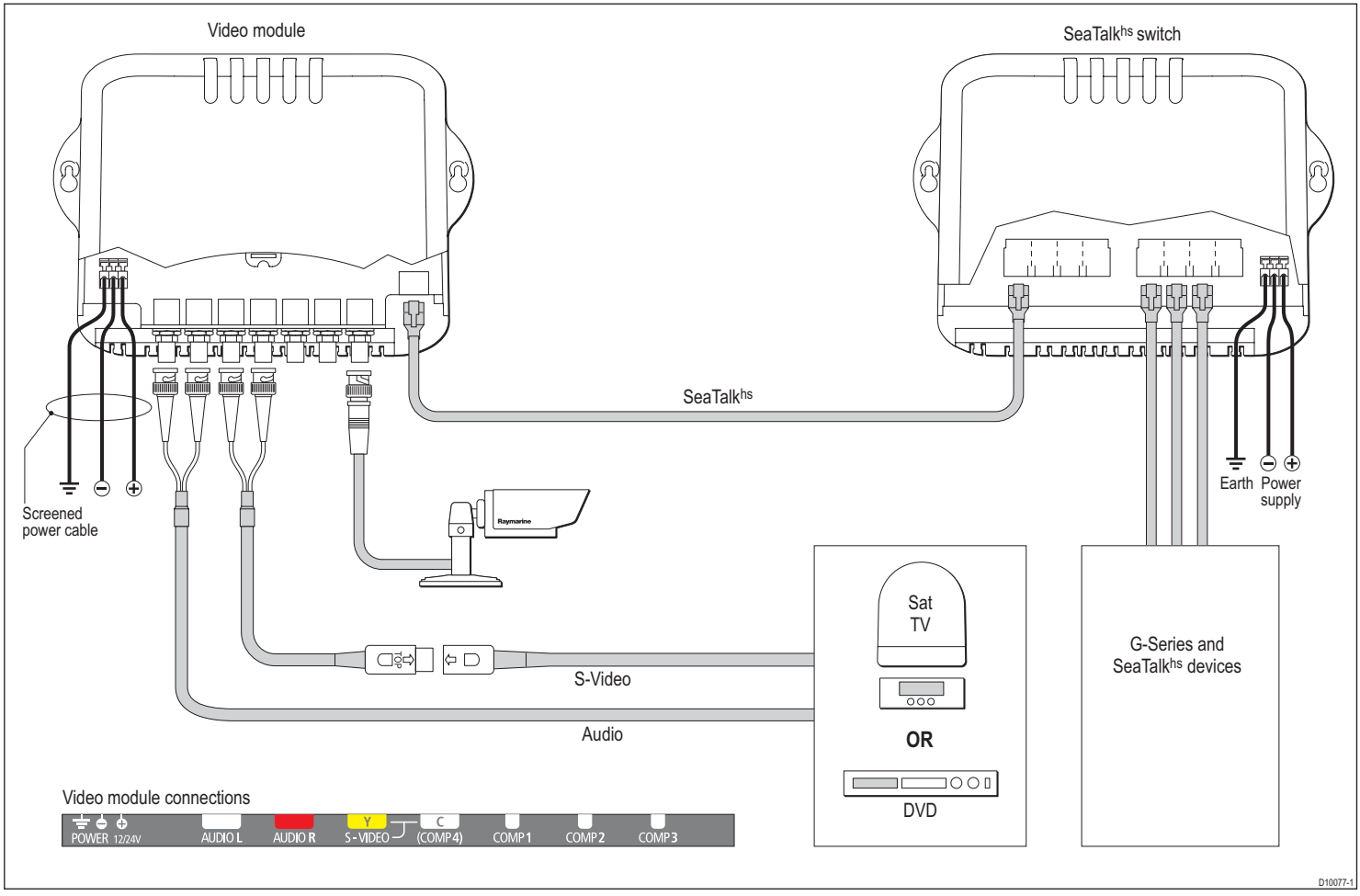
Typical video system



Maximum quantity of GVM400 video modules

The G-Series system will support up to 2 GVM400 video modules.

Video / Entertainment connection details



Video/Entertainment system cables

The following cables are used to connect the GVM400 video module:

Cable	Part No	Notes
S-Video		
1.5 m (4.9 ft) adapter cable	R08274	Included with GVM400.
Audio		
1.5 m (4.9 ft) audio cable	R08275	Included with the GVM400
AV cables	N/A	Installer to supply suitable cables.
Video and audio equipment should be supplied with appropriate cables to connect to the G-Series system.		
SeaTalk^{hs}	Use SeaTalk^{hs} Patch cables. See *page 47*	
Power	Power cables are not included with GVM400. You must supply appropriate power cables to suit your system requirements (see *page 35*).	
See *Appendix C* for other cables and accessories.		

Video output connection

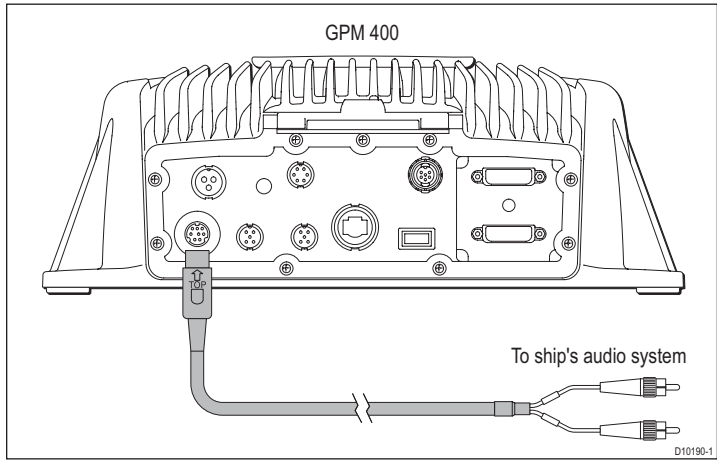
The video output is obtained from the GPM400 processor using DVI or VGA cables. See *Monitor connections* on *page 38* for details.

Audio output connection

G-Series audio output is obtained from the GPM400. The following audio signals are obtained through this output.:

- Entertainment / Audio from the Video processor. (Associated with the Comp4 or S-Video connection)
- Alarms and other system alerts.

Note: The audio output is line level only and must be connected to a suitable 3rd party amplifier in order to be heard.



Audio cables

The following cables are available to connect to the audio output:

Cable	Part No	Notes
Audio		
3 m (9.8 ft) Audio out cable	R08266	Supplied with GPM400.
15 m (49.2 ft) G-Series Audio out cable	R08298	

4.7 SeaTalk^{hs} network

The SeaTalk^{hs} network has 2 main purposes:

- Connection of digital devices.
- Networking of G-Series equipment.

For a typical SeaTalk^{hs} system see *page 19*.

SeaTalk^{hs} devices

The following digital devices communicate via the SeaTalk^{hs} network:

- **SeaTalk^{hs} Switch**
  The hub of the network, this routes all network traffic.
- **GPM400 processors**
  For sharing data over the network.
- **GVM400 Video Module**
  For video distribution over the G-Series network. See *page 43*
- **Digital radar**
- **Digital sounder (e.g. DSM400)**
  For fishfinding applications. Refer to the separate instructions supplied with the sounder.
- **G-Series marine displays** (G190, G170 etc.)
  To allow control of display functions at the G-Series keyboard. See *page 38*
- **SR100 Sirius weather/audio receiver** (North America only.)
  To receive sirius satellite weather and audio services.

See also

For a typical SeaTalk^{hs} system see *page 19*.

For more details on the connections refer to the separate instructions supplied with the digital devices and the SeaTalk^{hs} switch.

SeaTalk^{hs} Network cables

All devices are wired individually back to the SeaTalk^{hs} switch using the following cables:

Cable		Notes
SeaTalk^{hs} network		
1.5 m (4.9 ft) SeaTalk^{hs} network cable	E55049	Network cables are used to connect the GPM400 to the SeaTalk^{hs} switch.
5 m (16.4 ft) SeaTalk^{hs} network cable	E55050	
10 m (32.8 ft) SeaTalk^{hs} network cable	E55051	
15 m (49.2 ft) SeaTalk^{hs} network cable	A62135	
20 m (65.6 ft) SeaTalk^{hs} network cable	E55052	
SeaTalk^{hs} patch		

Cable		Notes
1.5 m (4.9 ft) SeaTalk^{hs} patch cable	E06054	Patch cables are used to connect the following devices to the SeaTalk^{hs} switch: • GVM400 video module • SeaTalk^{hs} Switch (connecting to other SeaTalk^{hs} switches). • G-Series marine displays.
5 m (16.4 ft) SeaTalk^{hs} patch cable	E06055	
10 m (32.8 ft) SeaTalk^{hs} patch cable	E06056	
15 m (49.2 ft) SeaTalk^{hs} patch cable	A62136	
20 m (65.6 ft) SeaTalk^{hs} patch cable	E06057	
Power	Power cables are not included with the SeaTalk^{hs} switch. You must supply appropriate power cables to suit your system requirements (see *page 35*).	
See *Appendix C* for other cables and accessories.		

Increasing network capacity

For increased capacity the network may contain multiple SeaTalk^{hs} switches, connected together using SeaTalk^{hs} network patch cables.

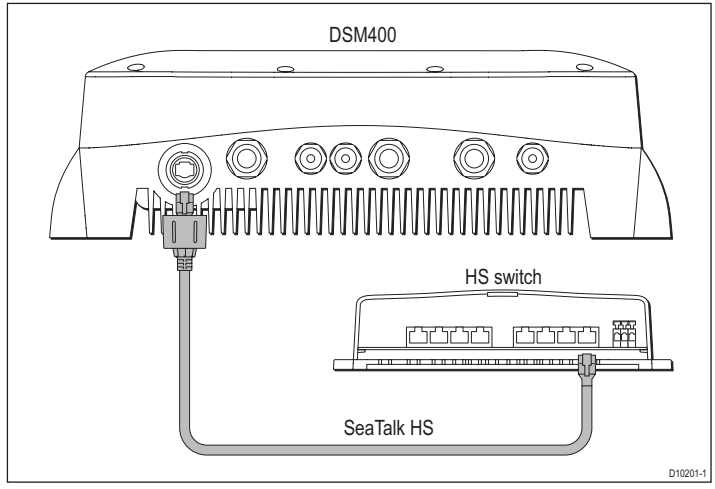
DSM digital sounder connection

The G-Series system can be used with the following DSM units:

- DSM300
- DSM400

The DSM connects to G-Series system via the SeaTalk^{hs} switch.

Example: DSM400 connection



Maximum quantity of DSM sounders

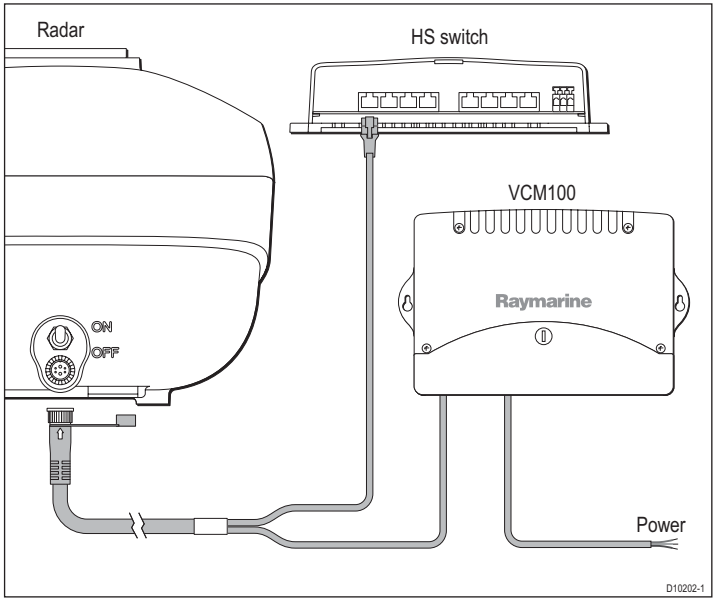
The G-Series system will support 1 DSM sounder.

See also

For more information refer to the installation guide supplied with the DSM unit.

Digital radar connection

The digital radar scanner connects to the SeaTalk^{hs} switch using dedicated digital radar cables



Maximum quantity of Radar scanners

The G-Series system will support up to 2 digital rader scanners.

Digital radar cables

The following cables are used to connect the digital radar scanner:

Cable	Part No	Notes
Digital cable		
5 m (16.4 ft) Digital cable	A55076	
10 m (32.8 ft) Digital cable	A55077	
15 m (49.2 ft) Digital cable	A55078	
25 m (82.0 ft) Digital cable	A55079	
Digital extension cable		Required if you wish to extend the cable distance.
5 m(16.4 ft) extension cable	A5080	
10 m (32.8 ft) extension cable	A55081	
The maximum cable length including all extensions is 55 m (180 ft)		

See also

For more information refer to the installation guide supplied with the radar scanner.

4.8 GPS Connection

Depending upon your GPS type it may be either connected via SeaTalk or NMEA 0183.

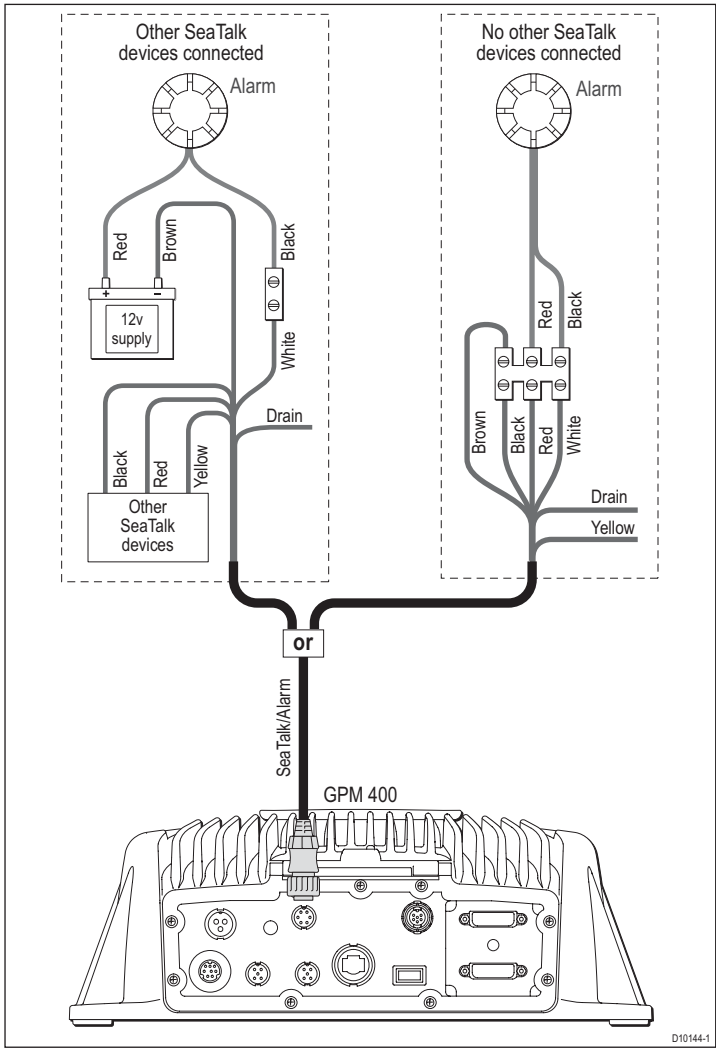
For SeaTalk connection refer to:

- SeaTalk & Alarm connection on page 50.
- Separate instructions supplied with your GPS unit.

For NMEA 0183 connection refer to:

- NMEA 0183 connections on page 51
- Separate instructions supplied with your GPS unit.

4.9 SeaTalk & Alarm connection



The alarm output and SeaTalk are combined into a single connector. This includes a 12 V fused power supply.

Alarm output

The alarm output is used to alert the operator to alarms and other audible warnings.

Note: Alarms are global and as such will be sounded across all audio and alarm outputs across the system.

SeaTalk connection

The SeaTalk connection allows the G-Series system to receive data from Raymarine SeaTalk compatible devices such as:

- **Autopilot**
  The G-Series can receive and display autopilot information and act as a repeat controller. Refer to the separate reference guide for operation details.
- **Instruments**
  The G-Series can receive and display data received from instruments, such as wind, speed and depth.
- **GPS**
  Required for chart applications.

Master GPM

The SeaTalk bus must be connected to the Master GPM (see *page 37*).

Note: SeaTalk connection to other GPMs for the purposes of redundancy is allowed.

12 V power supply

The SeaTalk connection provides a 12 V supply rated at 125 mA. This is suitable to supply 1 sounder module.

Note: SeaTalk instruments will usually be powered from a separate power supply, e.g from a Raymarine autopilot course computer. You should not power a SeaTalk bus from more than one supply.

SeaTalk / Alarm output cables

The following cable is used to connect the SeaTalk / Alarm output:

Connection / Cable	Part No	Notes
Alarm / SeaTalk		
1.5 m (4.9 ft) SeaTalk/Alarm Out cable	E55054	Supplied with GPM400 processor.
See *Appendix C* for other cables and accessories.		

4.10 NMEA 0183 connections

The GPM400 processor has 2 NMEA 0183 connectors.

Dual speed: 38.4 or 4.8 Kbps as required.

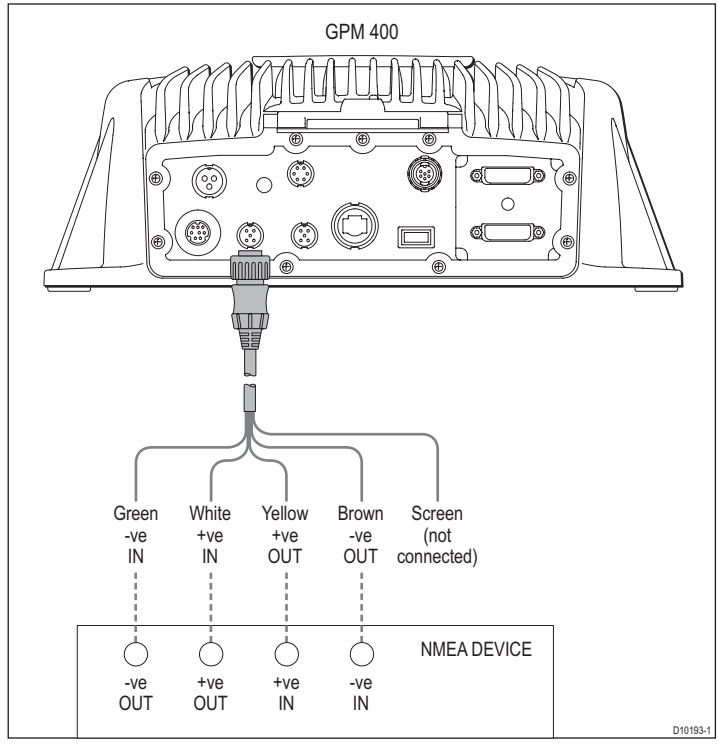
These may be used for connection of NMEA compliant devices for data such as:

- **Fastheading**, from an autopilot or fastheading sensor.
  This is required for Radar target acquisition (MARPA). See *page 52* and your separate autopilot instructions.
- **AIS information** (for radar target identification).
  See *page 53* and your separate AIS receiver instructions.
- **Other NMEA data** (such as 3rd party GPS or autopilot systems).
  For other NMEA device connections refer to the separate manufacturers instructions.

Multiple NMEA devices

You may connect NMEA devices to any GPM400 including the master GPM. You should only connect 1 device of any particular type to the G-Series system (including any connected databus or networked electronics).

For example: Your system should have GPS connected to one place only. Duplicated GPS data will produce erratic behavior within the system.



NMEA 0183 connection cables

The following cables are used to connect to NMEA 0183 devices.

Connection / Cable	Part No	Notes
1.5 m (4.9 ft) NMEA 0183 cable	R08004	Supplied with GPM400 processor unit.
Other NMEA connections	N/A	Installer to supply suitable data cable.
	Use a shielded twisted pair cable to minimise interference.	
See *Appendix C* for other cables and accessories.		

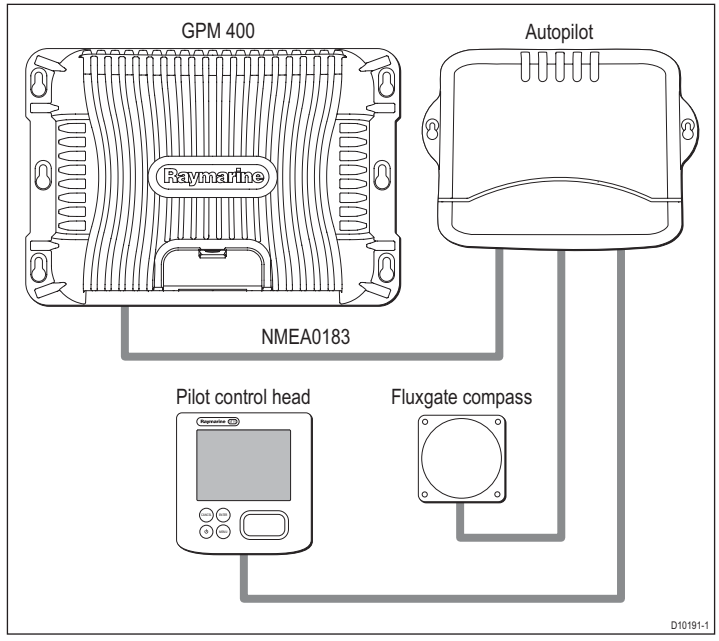
NMEA 0183 Raymarine cable cores:

Function (at GPM400 processor)	Color	Pin no.
NMEA Input (-ve) common	Green	1
NMEA Input (+ve)	White	2
NMEA Output (+ve)	Yellow	3
NMEA Output (-ve) common	Brown	4
Not connected	Screen	5

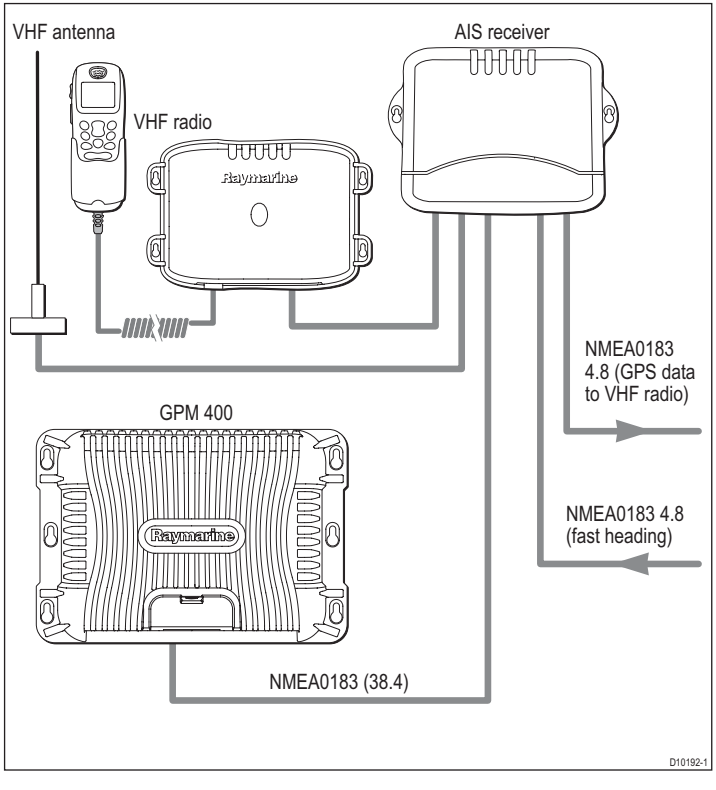
Note: Input and outputs are crossed.
Input GPM400 is connected to output at NMEA device and vice versa.

Fastheading connection

Fastheading data required for radar target acquisition (MARPA) may come from either the autopilot or a separate Raymarine Fastheading sensor.



AIS connection



For more information refer to separate AIS instruction documents.

4.11 SeaTalk^{ng} connections

The G-Series system will use SeaTalk^{ng} to communicate with:

- SeaTalk^{ng} instruments (e.g. ST70),
- SeaTalk^{ng} autopilots (e.g. ST70 with SPX course computer),
- G-Series keyboard.

SeaTalk^{ng} cables

The SeaTalk^{ng} system uses the following cables and connections.

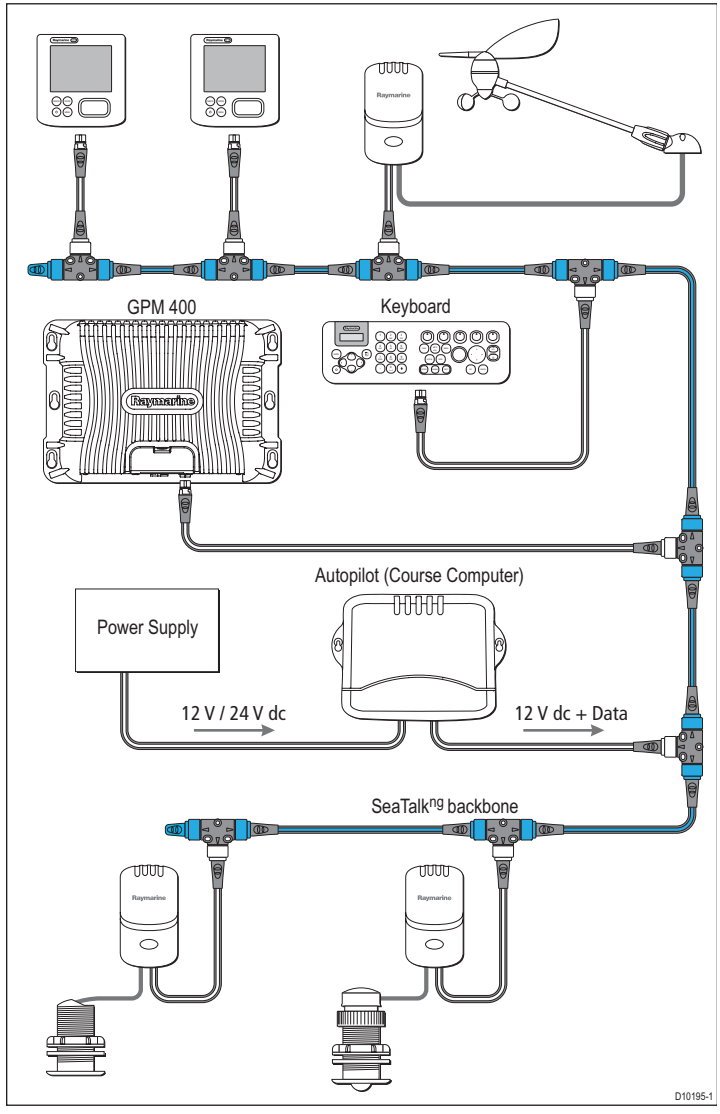
Connection / Cable	Notes
Backbone cables (various lengths)	The main cable carrying data. Spurs from the backbone are used to connect SeaTalk^{ng} devices.
T-piece connectors	Used to make junctions in the backbone to which devices can then be connected.
Terminators	Required at either end of the backbone.
Spur cables	Used to connect devices. Devices may be daisy chained or connected directly to the T-pieces.
For more information refer to the separate SeaTalk^{ng} reference manual.	

SeaTalk^{ng} power

The SeaTalk^{ng} bus requires a 12 V power supply. This may be provided from:

- Raymarine equipment witha regulated 12 V supply. (e.g. a SmartPilot course computer)
- Other suitable 12 V supply. (Note the grounding requirements for the G-Series system, see page *page 34*.

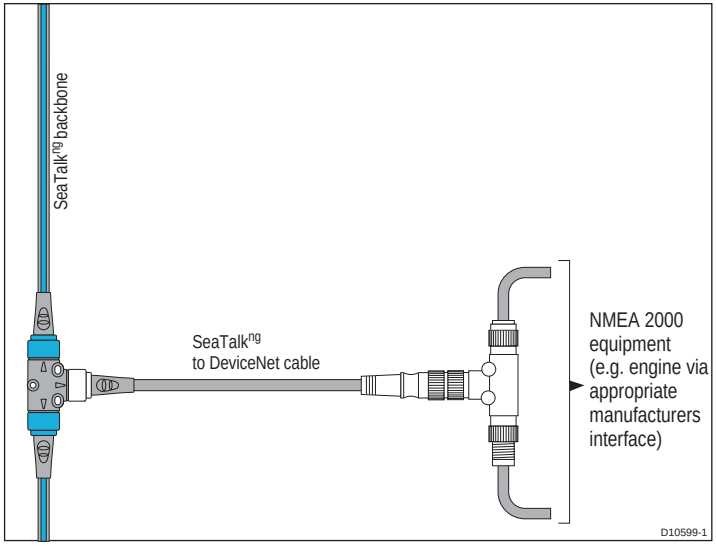
Typical SeaTalk^{ng} system



4.12 NMEA 2000 connections

NMEA 2000 devices are connected using the SeaTalk^{ng} bus. The G-Series system can display data received from NMEA 2000 devices (e.g. for displaying data from compatible engines).

You may connect NMEA 2000 compatible devices using appropriate adaptor cables.



NMEA 2000 cable

The following cable is used to connect the NMEA 2000 devices to the SeaTalk^{ng} bus:

Connection / Cable	Part No	Notes
1.5 m (4.9 ft) SeaTalk^{ng} to DeviceNet male	A06046	

See also

For more information refer to the separate SeaTalk^{ng} reference manual.

Chapter 5: Installation and mounting

5

This section gives details for installation and mounting of the core components of the G-Series system. Use this information when planning and installing your system.

Chapter contents

- 5.1 General instructions. Page 58
- 5.2 GPM400 Processor module. Page 59
- 5.3 G-Series Keyboard. Page 60
- 5.5 GVM400 Video Module. Page 66
- 5.6 Alarm buzzer. Page 67

See also

- Monitor installation. Refer to the separate instructions supplied with the monitor.
- Peripheral equipment. Refer to the instructions supplied with the individual packs.
- Cabling and connections - Chapter 4: Cables and connections. Page 31.

5.1 General instructions

Equipment location

When deciding on the location of system components, consider the following:

- Ignition hazards
- Ventilation
- Mounting surface
- Cable entry
- EMC installation guidelines

Ignition hazards

Potential ignition sources

The equipment in these instructions is NOT approved for use in hazardous/flammable atmospheres such as an engine room.

Ventilation

To ensure adequate airflow:

- Ensure that equipment is mounted in a compartment of suitable size.
- Ensure that ventilation holes are not obstructed.
- Allow adequate separation of equipment.

Any specific requirements for each system component are provided later in this chapter.

Mounting surface

Ensure equipment is adequately supported on a secure surface.

Do not mount units or cut holes in places which may damage the structure of the vessel.

Any specific requirements for each system component are provided later in this chapter.

Cable entry

Ensure the unit is mounted in a location which allows proper routing and connection of cables:

- Minimum bend radius of 100 mm (3.94 in).
- Use cable supports to prevent stress on connectors.

EMC installation guidelines

Raymarine equipment and accessories conform to the appropriate Electromagnetic Compatibility (EMC) regulations. This minimizes electromagnetic interference between equipment, which could otherwise affect the performance of your system.

Correct installation is required to ensure that EMC performance is not compromised.

For optimum EMC performance, we recommend that:

- Raymarine equipment and the cables connected to it are:
  i. At least 3 ft. (1 m) from any equipment transmitting or cables carrying radio signals e.g. VHF radios, cables and antennas. In the case of SSB radios, the distance should be increased to 7 ft. (2 m).
  ii. More than 7 ft. (2 m) from the path of a radar beam. A radar beam can normally be assumed to spread 20 degrees above and below the radiating element.
- The product is supplied from a separate battery from that used for engine start. This is important to prevent erratic behavior and data loss which can occur if the engine start does not have a separate battery.
- Raymarine specified cables are used.
- Cables are not cut or extended unless doing so is detailed in the installation manual.

Remember

Where constraints on the installation prevent any of the above recommendations:

- Always allow the maximum separation possible between different items of electrical equipment.
- This will provide the best conditions for EMC performance for the installation.

Suppression ferrites

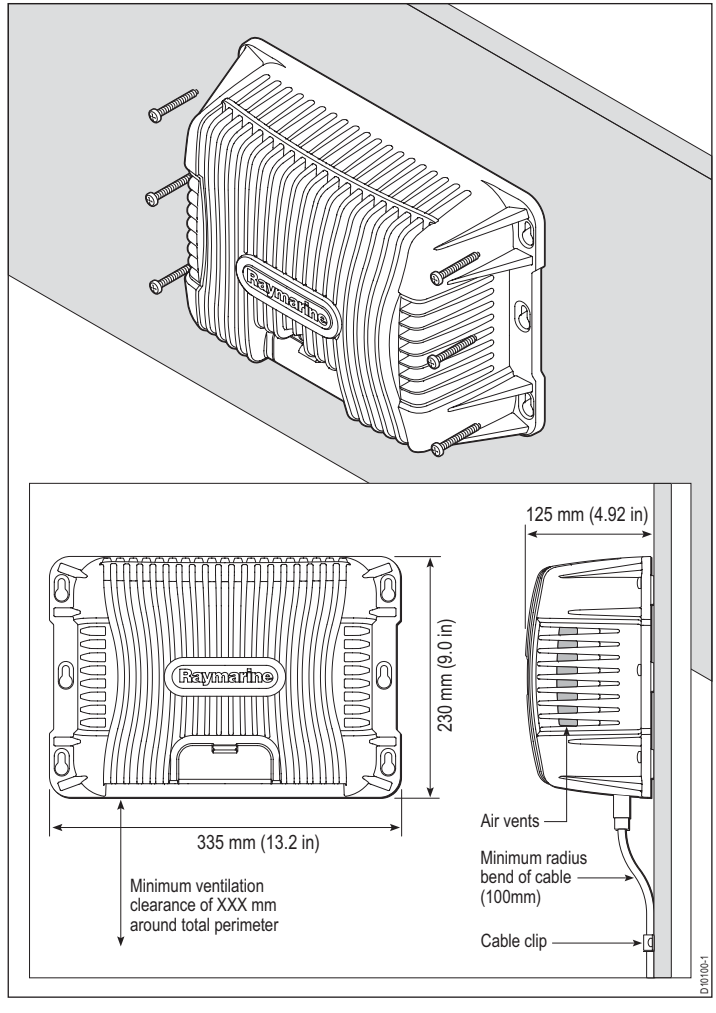
Raymarine cables may be fitted with suppression ferrites. These are important for correct EMC performance. Any ferrite removed to facilitate installation must be replaced in the original position immediately after the installation is complete.

- Use only ferrites of the correct type, supplied by Raymarine authorized dealers.

Connections to other equipment

If Raymarine equipment is to be connected to other equipment using a cable not supplied by Raymarine, a Raymarine suppression ferrite MUST always be attached to the cable near the Raymarine unit.

5.2 GPM400 Processor module



Mounting and environment

The following conditions apply:

- Do NOT install near sources of heat or vibration (e.g. engine).
- The unit is NOT designed for use in a sealed enclosure. Access to the unit is required, e.g. for chart updates.
- Must be mounted on a vertical surface. Sides and top must be level.
- Mounting surface must be firm, secure and capable of supporting the weight of the unit.
- Install below decks in a dry area.
- Install the unit well away from potential sources of ignition.

Mounting clearances

Allow the following clearances from other equipment and surfaces.

Side	Distance
Top	100 mm (3.94 in)
Left	100 mm (3.94 in)
Right	100 mm (3.94 in)
Bottom	To allow cable entry
Front	150 mm (5.91 in)

Cables

- Minimum bend radius of 100 mm (3.94 in)
- All cables must be secured within 150 mm (5.91 in) of the unit. This will prevent undue strain on the connectors.

See also

Ensure you record connections to the GPM400 on the schematic diagram. See Appendix B - Nav Station schematic.

For connection details, see *page 31*.

5.3 G-Series Keyboard

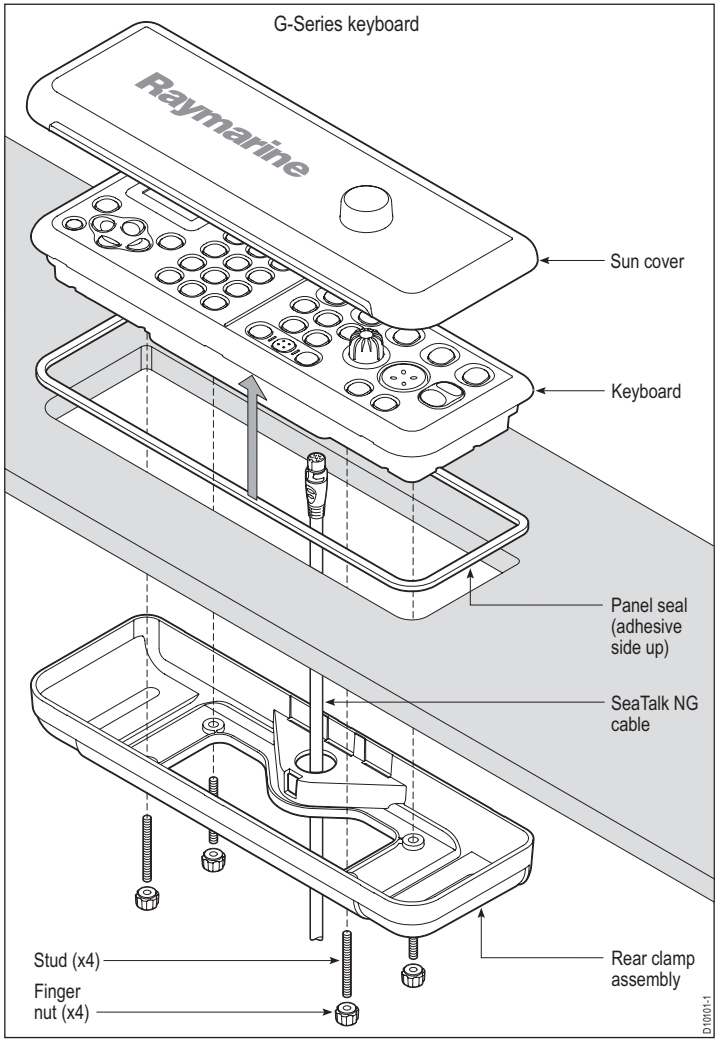
The Keyboard can be installed for 2 different types of use:

- Wired operation (flush mounted).
- Wireless operation, using the wireless upgrade kit and SeaTalk^{ng} basestation.

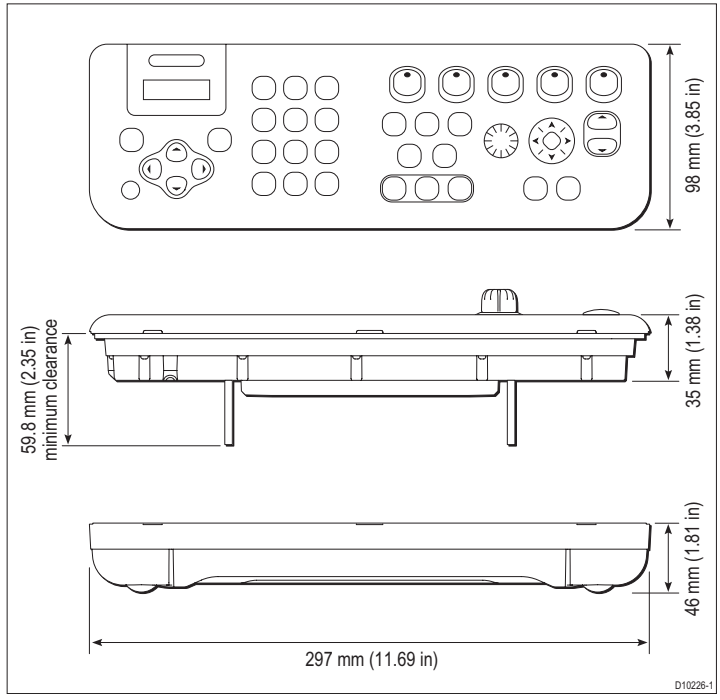
Note: You should have at least one permanently wired keyboard. In the event that any wireless keyboards are lost, the wired keyboard can be used to control the system.

Wired operation - flush mounted

Mounting arrangement



Dimensions



Mounting and environment

- The keyboard is suitable for mounting both above and below decks. It is waterproof to CFR-46 standard.
- Use the cutting template provided with the keyboard.
- Connect cable into keyboard before clamping in place.

The following conditions apply:

- Do NOT install near sources of heat. (e.g. engine).
- Install the unit well away from potential sources of ignition.

Cables

- Minimum bend radius of 100 mm (3.94 in).

See also

Ensure you record your keyboard details on the schematic diagram. See Appendix B - Nav Station schematic.

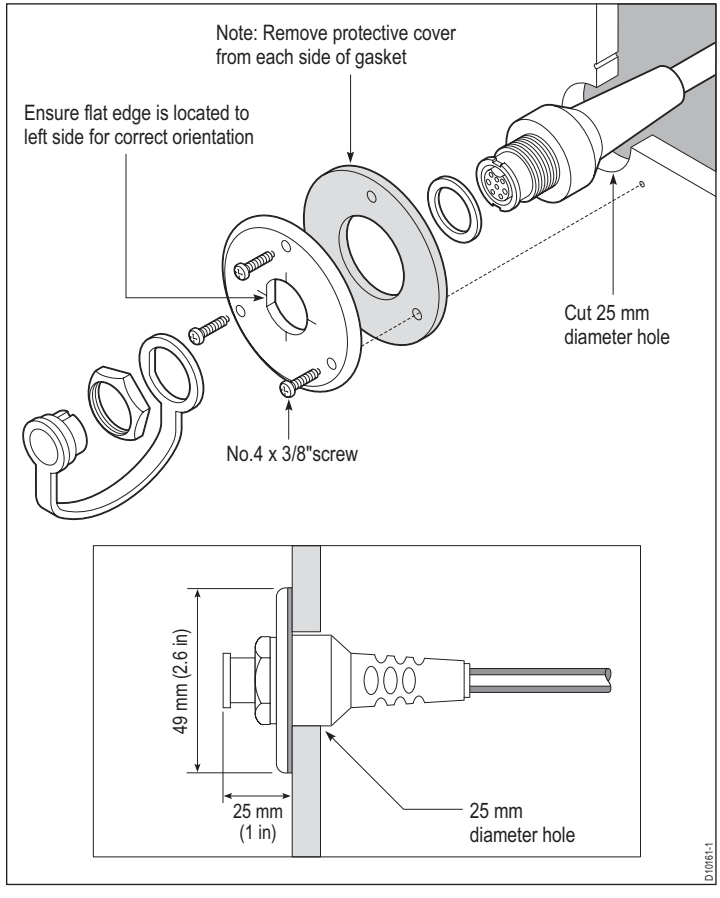
Wireless upgrade kit

Allows wireless operation of the keyboard.

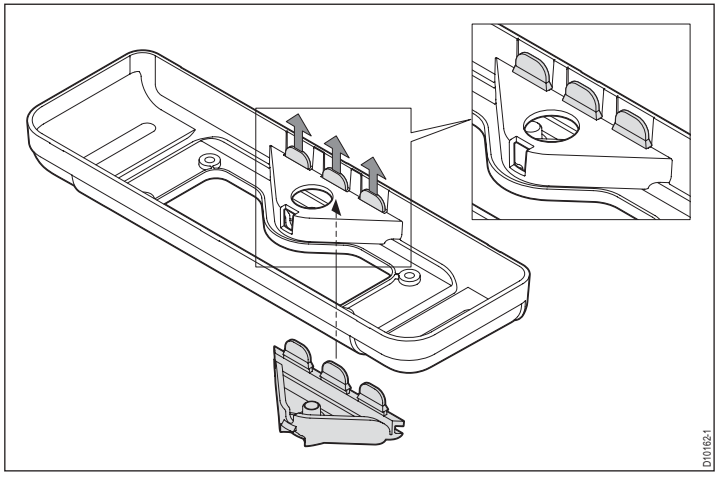
Mounting and environment

- The should be within sight of G-series monitors. This will allow a keyboard to operate the system whilst on charge.

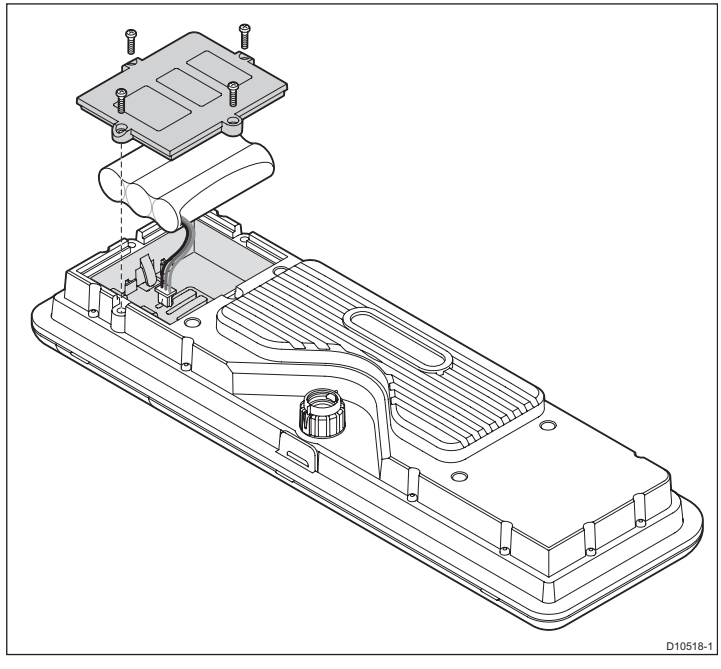
1. Install charge point.


Note: Remove protective cover from each side of gasket
Ensure flat edge is located to left side for correct orientation
Cut 25 mm diameter hole
No.4 x 3/8"screw
49 mm (2.6 in)
25 mm (1 in)
25 mm diameter hole
D10161-1

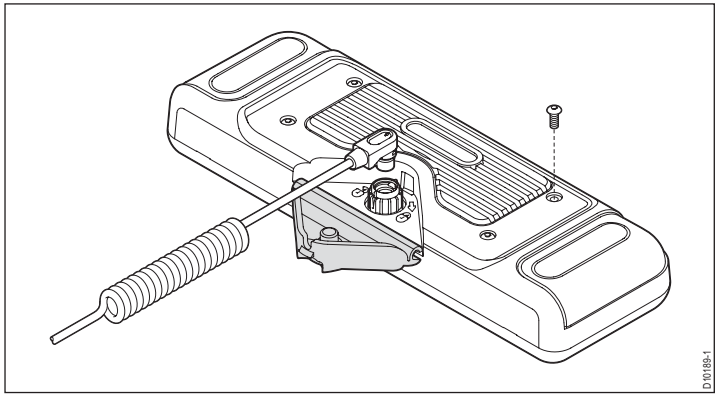
2. Fit splash cover.



3. Fit the battery, taking care to avoid contamination of the cover seal.



4. Fit the rear cover.

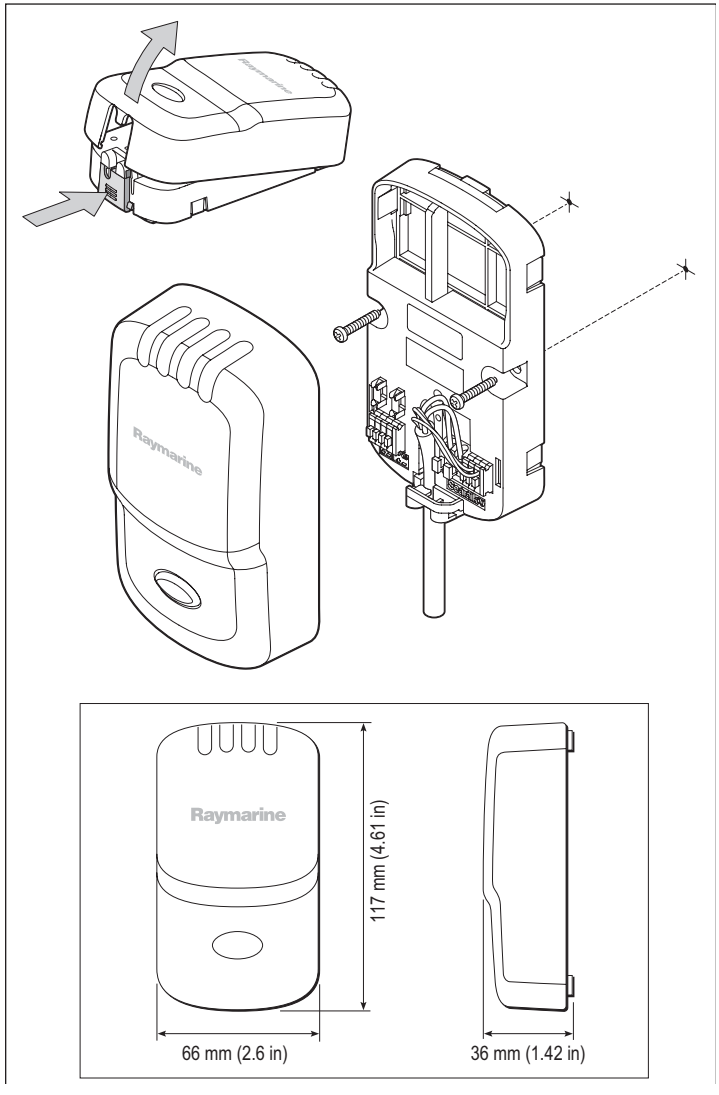


5. For charging and wired operation use the cable provided

Note: The keyboard should be charged for 6 hours before use.

Wireless basestation

Required for wireless operation of the keyboard.



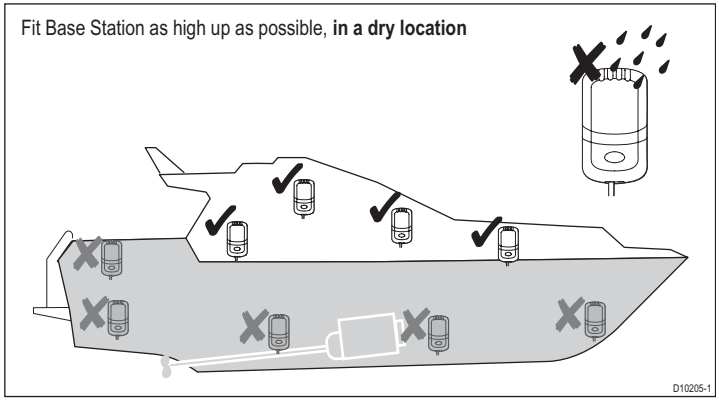
Mounting and environment

The following conditions apply:

- You must perform a site survey to find an appropriate location and ensure good wireless reception around the boat.
- Do NOT install near sources of heat or vibration. (e.g. engine).
- Install in a dry area as high on the vessel as possible.
- Mount on a vertical surface.
- Install the unit well away from potential sources of ignition.
- Mount at least 1 m (3 ft) away from devices which may be affected by radio transmission (e.g. compass)

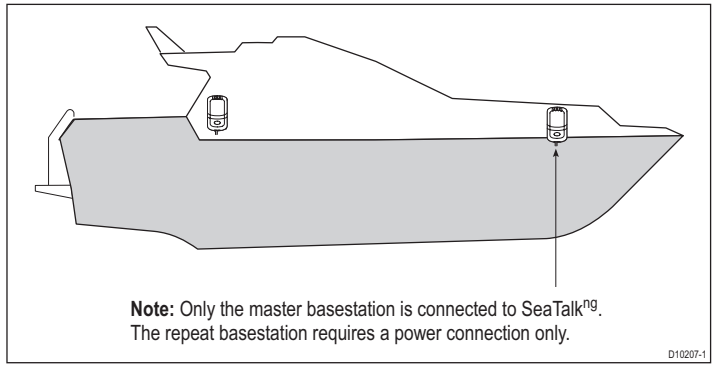
Site survey (wireless coverage)

You will need to survey the wireless coverage to ensure that wireless devices can operate around the vessel.



Repeat basestation

A repeat basestation may be used to optimize wireless coverage.


Note: Only the master basestation is connected to SeaTalk^{ng}.
The repeat basestation requires a power connection only.
D10207-1

Note: Only the master basestation is connected to SeaTalk^{ng}. The repeat basestation requires a power connection only.

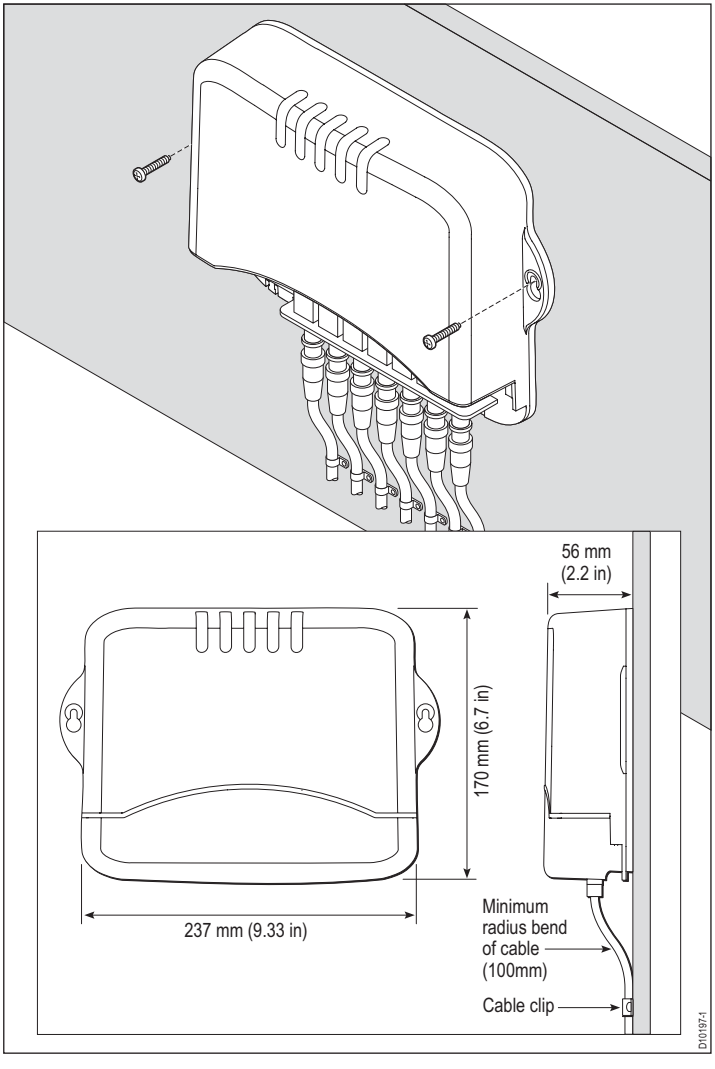
5.4 G-Series Monitors

To install your monitor refer to the separate instructions provided.

See also

Ensure you record your monitor details on the schematic diagram. See Appendix B - Nav Station schematic.

5.5 GVM400 Video Module



Mounting and environment

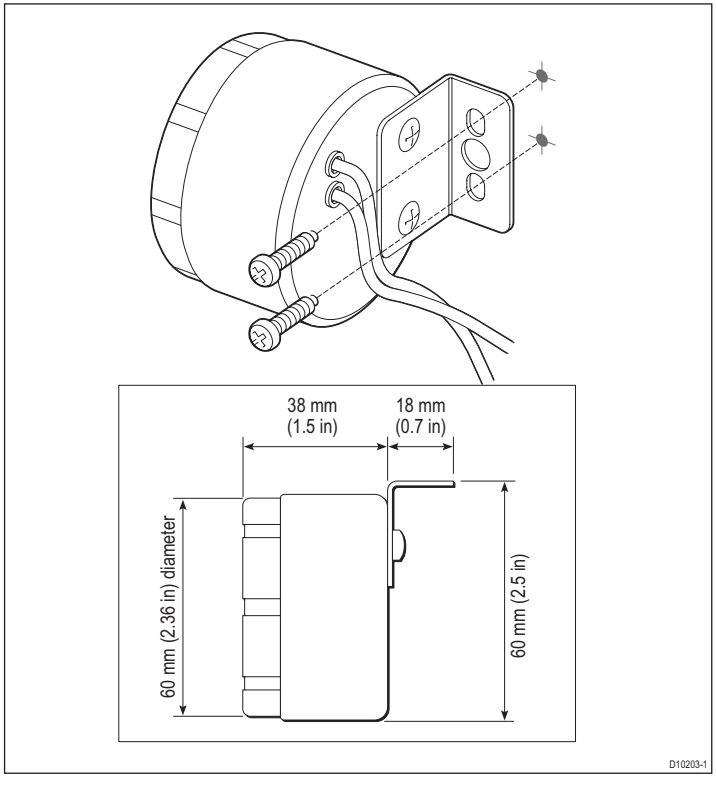
- Mount below decks in a dry area
- Install on a vertical surface.
- Do NOT mount near sources of heat or vibration. (e.g. engine)
- Install well away from potential sources of ignition.

Cables

- Minimum bend radius of 100 mm (3.94 in).
- Power cable should be fixed to the plastic case using the cable tie provided.
- All video / data cables must be secured within 150 mm (5.91 in) of the unit using a suitable cable clip. This will prevent undue strain on the connectors.

5.6 Alarm buzzer

The alarm is used to alert the operator to alarms and other audible warnings.



Mounting and environment

- Mount below decks in a dry area
- Install on a vertical surface.
- Do NOT mount near sources of heat or vibration. (e.g. engine)
- Install well away from potential sources of ignition.

Chapter 6: Initial test

This section gives details for the initial tests and checks to be carried out once installation is complete.

Chapter contents

- Turn on breakers on page 70
- Marine monitor checks on page 70
- Keyboard checks on page 70
- GPM400 processor checks on page 70
- GVM400 video processor checks on page 70
- SeaTalk^{hs} switch on page 70

See also

For help with diagnosing and rectifying faults, refer to Chapter 9: Troubleshooting.

Before powering up

Before proceeding with the power on test of your system please ensure that:

- Radar and all ancillary equipment has been installed and connected in accordance with the manufacturers instructions.
- All G-Series equipment has been installed and connected in accordance with the G-Series installation instructions.

6.1 Power up test

It is advisable to perform an initial power-up test to help ensure that the system is wired correctly.

Perform the following initial checks before proceeding to the commissioning stage:

Turn on breakers

Turn on the power to the equipment at the distribution panel:

1. Monitors and ancillary equipment.
2. GPM400 processors.

Power up sequence

Power up the monitors first to allow the boot sequence and start-up information to be shown at master monitors.

Check system:

Wait for 2 minutes whilst the boot sequence is completed, then check each of the following:

- Monitors
- Keyboards
- GPM400 processors
- GVM400 Video Modules
- SeaTalk^{hs} Switch
- DSM sounder module. (refer to separate instructions supplied with the DSM)

Marine monitor checks

You will need to select the appropriate input on each monitor.

On a G-Series marine monitor:

- Press the power key (if required)
- Press the Left/Right arrow keys to scroll through the inputs.

On a healthy system all monitors will:

- show the G-Series set-up wizard screen on the appropriate input channel.

Note: Only the master monitors will show the initial boot sequence. The repeat monitors may not begin to operate until the system has ran through its start-up sequence (approximately 2 minutes after power on).

Keyboard checks

You can check that each keyboard is correctly connected by looking at its LCD monitor.

On a healthy system all keyboards will:

- Display the message “NOT ASSIGNED”.

GPM400 processor checks

Check that each GPM is correctly connected by looking at its LED (found next to the SeaTalk/alarm output).

On a healthy GPM400:

- LED will flash Green.

For a full LED status listing see *page 99*.

GVM400 video processor checks

Check that each GPM is correctly connected by looking at its LED (found next to the SeaTalk/alarm output).

On a healthy GVM400:

- LED will flash Green.

For a full LED status listing see *page 100*.

SeaTalk^{hs} switch

Use this to check the status of your SeaTalk^{hs} network connections.

On a healthy SeaTalk Switch:

- Each connected channel will have one flashing and one steady green LED.

For a full LED status listing see *page 98*.

Chapter 7: Initial Setup

7

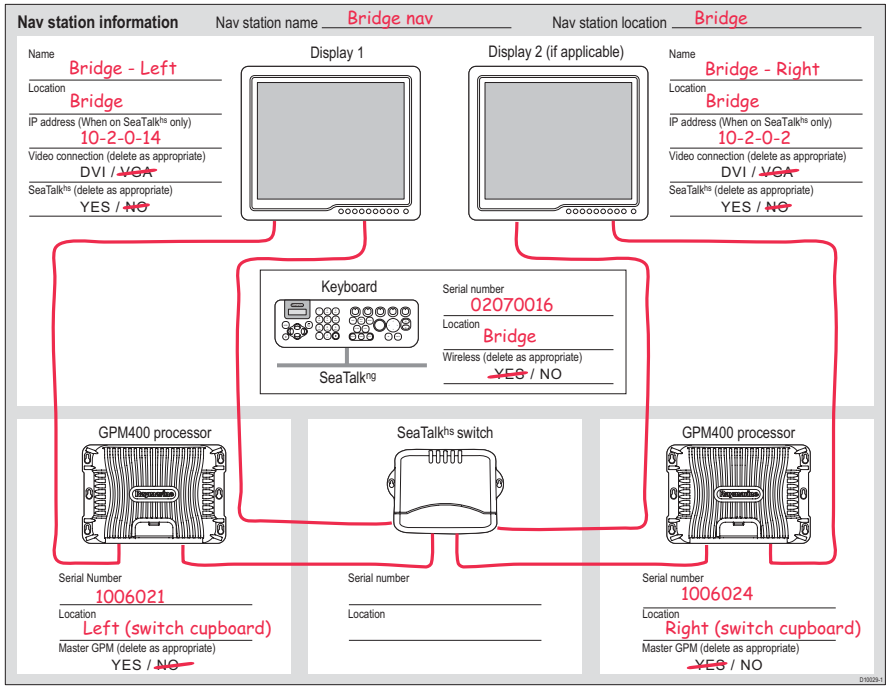
This chapter provides information for the initial setup of a new system

Chapter contents

- 7.1 Power up the system on page 74
- 7.3 Select Master GPM on page 75
- 7.2 First time configuration on page 74
- 7.4 Configure Nav Stations on page 77
- 7.5 Assign Keyboards on page 78

Schematic diagram

You will need details of the equipment connections and serial numbers. You should have entered these onto the Nav Station schematic diagrams during the installation.



7.1 Power up the system

Before powering up

Before proceeding with the power on test of your system please ensure that:

- Radar and all ancillary equipment has been installed and connected in accordance with the manufacturers instructions.
- All G-Series equipment has been installed and connected in accordance with the G-Series installation instructions.

Turn on breakers

Turn on the power to the equipment at the distribution panel.

1. Monitors and ancillary equipment
2. GPM400 processors.

Power up sequence

Power up the monitors first to allow the boot sequence and start-up information to be shown at master monitors.

See also

For information on repeat / master monitors see *page 38*.

7.2 First time configuration

There is an automatic menu sequence when you set up the system for the very first time (i.e. for systems which do not yet have any Nav Stations configured). This will automatically display the appropriate menus at power up, to help you to configure your Nav Stations.

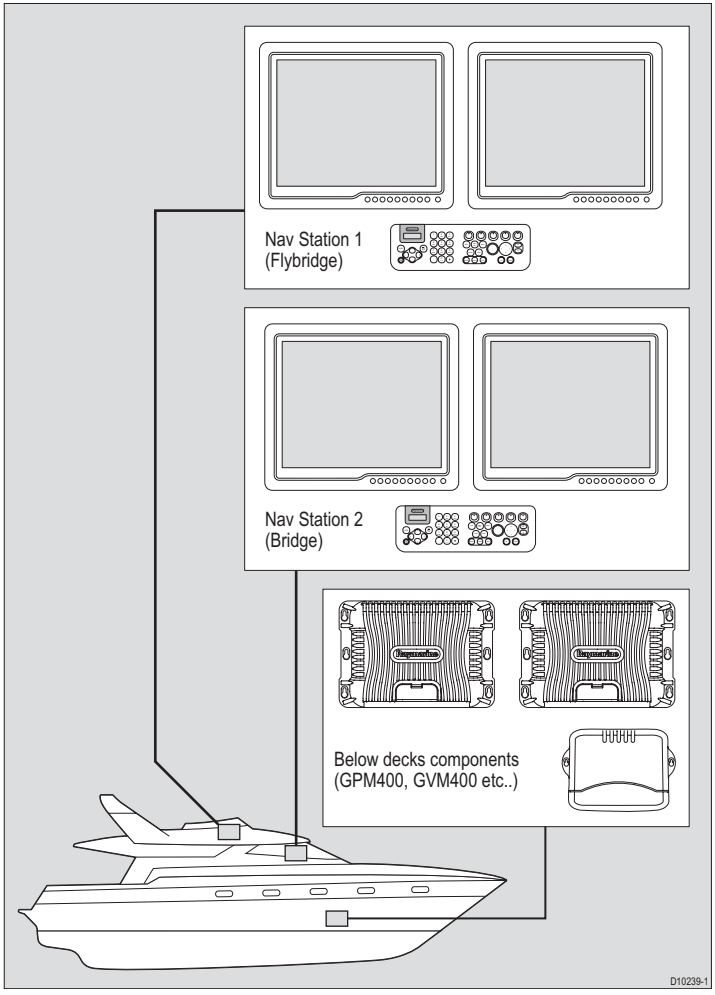
First time configuration, automatic sequence
Select Master GPM • To set the Master GPM on page 76 Create Nav Station • To create a new Nav Station on page 77 • To assign monitors to a Nav Station on page 77 Assign Keyboards • Assign Keyboards on page 78
Appropriate set-up menus will automatically appear on the monitor.

Note: First time configuration must be done at a monitor connected to the master GPM (see *page 75*).

Nav Station

A Nav Station is a group of monitors, GPM processors and Keyboards. This provides a location from where users can view and control the G-Series system.

Typical Nav station arrangement



Each display within a Nav Station must be connected to a different GPM400. This is because the master and repeat displays connected to any single GPM400 will both show the same information or page.

See also

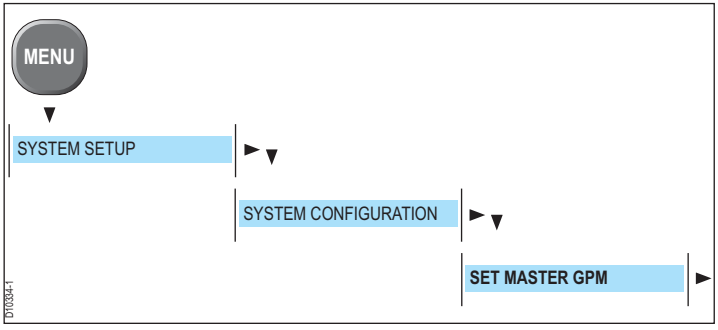
For more information on nav station connections, see Chapter 2: Typical systems.

7.3 Select Master GPM

The GPM400 master handles the data from the marine electronics installed around the boat. It receives data (e.g. via SeaTalk^{ng}) and transmit this around the G-Series system via the SeaTalk^{hs} network.

Note: The initial set up should be done at a monitor connected to the master GPM. See *page 74*.

To open the Set Master GPM menu:



Select Master GPM - menu and soft keys

- **GPM-XXXXXXXXX**
  The available GPMs are listed by serial number. Cross refer these with the Serial numbers on your Nav Station schematic diagrams.
- **Local GPM**
  Indicates the GPM to which the monitor is physically connected.
- **Current Master**
  This is the GPM currently set at the master.

To set the Master GPM

1. Select the appropriate GPM from those displayed.
2. Press the **SET AS MASTER** softkey.

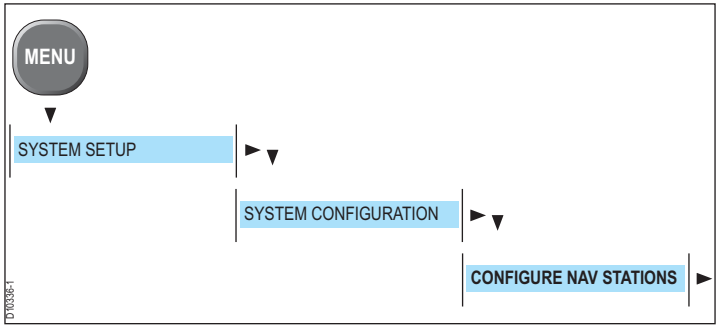
To identify the correct GPM

If you are unsure of which GPM to select, press the **DISCOVER GPM** softkey to show a message on every monitor which identifies the GPM to which it is connected.

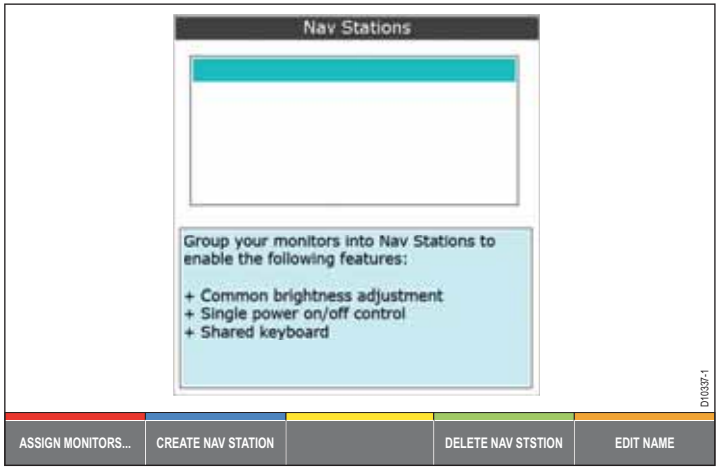
7.4 Configure Nav Stations

For a definition of a Nav station see First time configuration on page 74.

To open the Configure Nav Stations menu:



Nav Stations - menu and soft keys



To create a new Nav Station

from the Configure Nav Stations menu:

1. Press **CREATE NAV STATION** softkey/
2. Enter the name for the Nav Station.
   i. Press **SELECT NAME** to select from the list of pre defined names. OR
   ii. Press **EDIT NAME** to use a custom name.
3. Press **OK** when complete.

To assign monitors to a Nav Station

from the Configure Nav Stations menu:

1. Select the appropriate Nav Station from those displayed
2. Press **ASSIGN MONITORS**.
3. Select the monitors to be added.
   i. Press **ADD RAY** Monitor to select from the Raymarine monitors connected to the system. OR
   ii. Press **ADD OTHER MONITOR** to select a non Raymarine monitor.
4. Enter the appropriate information for the monitor type selected.

Assign monitors Information required	Monitor type(s)
Name • Press SELECT NAME to select from the list of pre defined names. OR • Press EDIT NAME to use a custom name.	ALL
GPM From the list displayed, select the GPM to which the monitor is connected. • DISCOVER GPM If you are unsure of which GPM to select, press the DISCOVER GPM softkey to show a message on every monitor which identifies the GPM to which it is connected.	ALL

Assign monitors Information required	Monitor type(s)
IP Address From the list displayed, select the IP address of the monitor being assigned. • DISCOVER IP If you are unsure of which monitor to select, press this softkey to identify the IP address of each monitor. • IDENTIFY MONITOR You can confirm that the correct monitor has been assigned by pressing this softkey. The selected monitor will then display its OSD menus, allowing it to be identified.	RAY monitors only
Input Select the monitor input to which the G-Series cable is connected (e.g. VGA 1)	RAY monitors only

To identify the correct monitor

Softkeys are provided to help you identify the correct monitor.

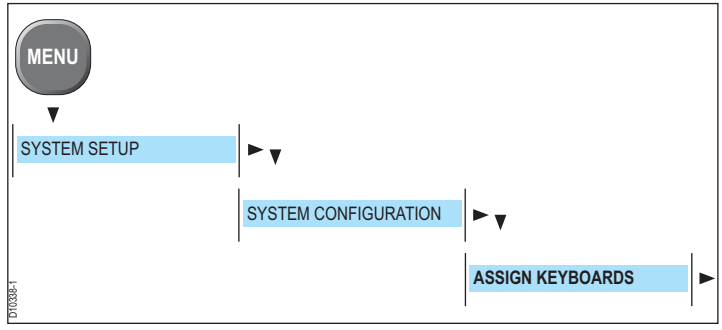
- **DISCOVER IP**
  If you are unsure of which monitor to select, press this softkey to identify the IP address of each monitor.
- **IDENTIFY MONITOR**
  You can confirm that the correct monitor has been assigned by pressing this softkey. The selected monitor will then display its OSD menus, allowing it to be identified.

7.5 Assign Keyboards

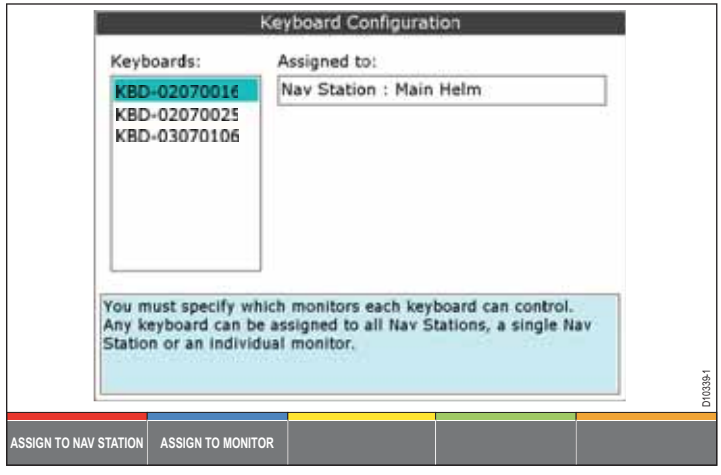
Introduction

You must assign each G-Series Keyboard to control a Nav station or an individual monitor.

To open the Assign Keyboards menu:



Keyboard Configuration - menu and soft keys



- **KBD-XXXXXXXXX**
  The available Keyboards are listed by serial number. Cross re-

fer these with the Serial numbers on your Nav Station schematic diagrams.

- **Assigned to**
  Shows the assignment of the selected keyboard.

To assign a Keyboard to a Nav Station

from the Assign Keyboards menu:

1. Select the desired keyboard from those displayed.
2. Press **ASSIGN TO NAV STN.**
   Then either:
   i. Select from the list of available Nav Stations. OR
   ii. Press the **ASSIGN TO ALL NAV STNS** softkey.
3. Press **OK** when complete.

To assign a Keyboard to an individual monitor

from the Assign Keyboards menu:

1. Select the desired keyboard from those displayed.
2. Press **ASSIGN TO MONITOR**.
3. Select from the list of available Monitors.
4. Press **OK** when complete

To identify the correct keyboard

If you are unsure of which keyboard to select, press the **IDENTIFY KEYBOARD** softkey to show a message on the monitor to identify the keyboard being used.

Chapter 8: Commissioning

8

This chapter provides information for the commissioning of a system once the initial setup is complete.

Chapter contents

- 8.1 Language setting on page 82
- 8.2 Compass heading setup on page 82
- 8.3 Radar setup on page 83
- 8.4 GPS checks on page 85
- 8.5 Fishfinder checks on page 86
- 8.6 Set up video on page 87
- 8.7 NMEA 0183 on page 88
- 8.8 Data checks on page 89

See also

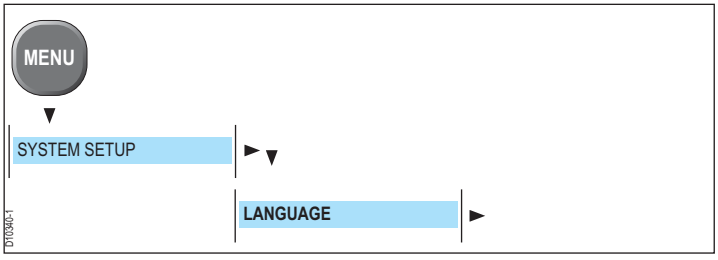
For details of how to operate the G-Series system or general navigation of the menus and pages, refer to the separate user reference guide.

8.1 Language setting

The system will operate in the following languages:

English (US)	English (UK)	Chinese
Danish	Dutch	Finnish
French	German	Greek
Icelandic	Italian	Japanese
Korean	Norwegian	Portuguese
Russian	Spanish	Swedish

To select a language:



Select the required language from those displayed.

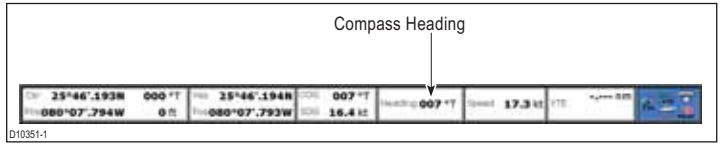
8.2 Compass heading setup

The G-Series system provides options to set up a Raymarine compass.

Note: If the compass is connected to a Raymarine autopilot, you should calibrate the compass heading using the autopilot controller, and proceed to the Radar setup (*page 83*).

Check heading

Provided that the system has a compass connected, the compass heading is displayed in the data bar at the top of the screen:

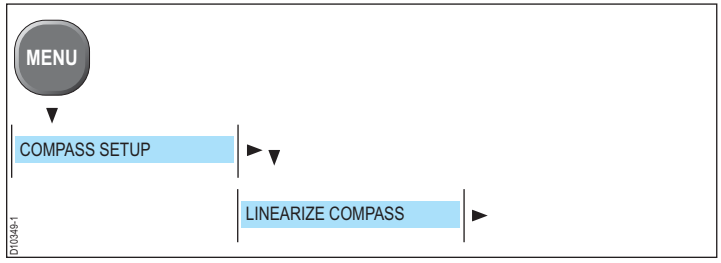


If no heading is displayed this could indicate a problem with the autopilot or compass connection. See Chapter 9: Troubleshooting. Page 91 for more information.

Linearize (swing) the compass

If your system has a Raymarine compass (e.g ST80 or Fasthead-ing sensor) which is not connected to an autopilot system, then you will need to linearize (swing) the compass using the G-Series system.

To linearize your compass:



1. Once you have selected LINEARIZE COMPASS, follow the on-screen instructions.
2. When instructed to align heading, press the **ALIGN HEADING** soft key and then turn the rotary control **one click at a time** to fine tune the heading.

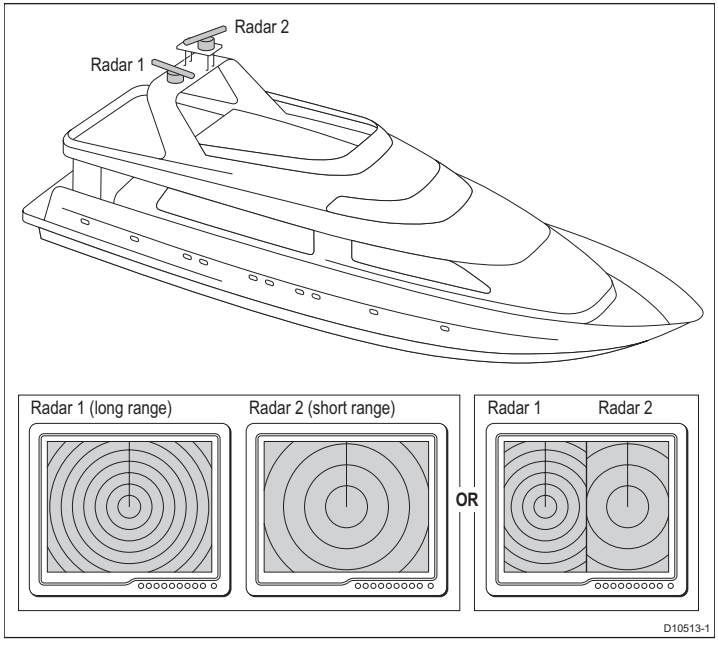
8.3 Radar setup

> **Electromagnetic energy**
> The radar scanner transmits electromagnetic energy. Ensure all personnel are clear of the scanner before switching to Tx (transmit mode).

2 scanner systems

The system may have 2 digital scanners connected. You can select the scanner to be used for each radar window.

For 2 scanner systems you must repeat the instructions in this (Radar setup) section, once for each scanner.



Initialize radar and set to transmit

You will need to:

- Initialize the radar
- Select a scanner (2 scanner systems only)
- Set radar to transmit

To initialize the radar

Select a Radar page by either:

i. Press the **PAGE** key to select from the current page set.

OR

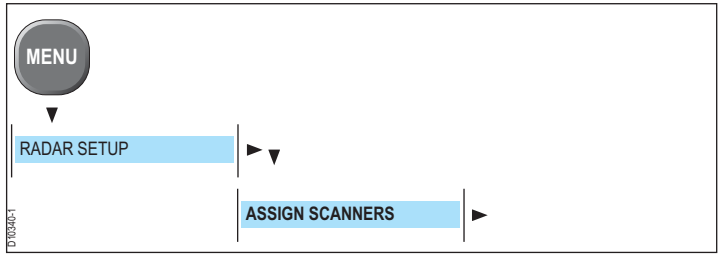
ii. Press and hold the **PAGE** key to select from all available pages.

The Radar scanners will now initialize in standby mode, this process will take approximately 70 seconds.

If the radar fails to initialize, refer to Chapter 9: Troubleshooting. Page 91.

To assign scanners (2 scanner systems only)

For 2 scanner systems you must select which scanner is to be used for the current radar view.



Scanners are listed by serial number (or name if assigned).

1. Select the appropriate scanner from those displayed.
2. Press **OK** when done.

Note: The **EDIT NAME** softkey allows you to assign a name to each scanner connected

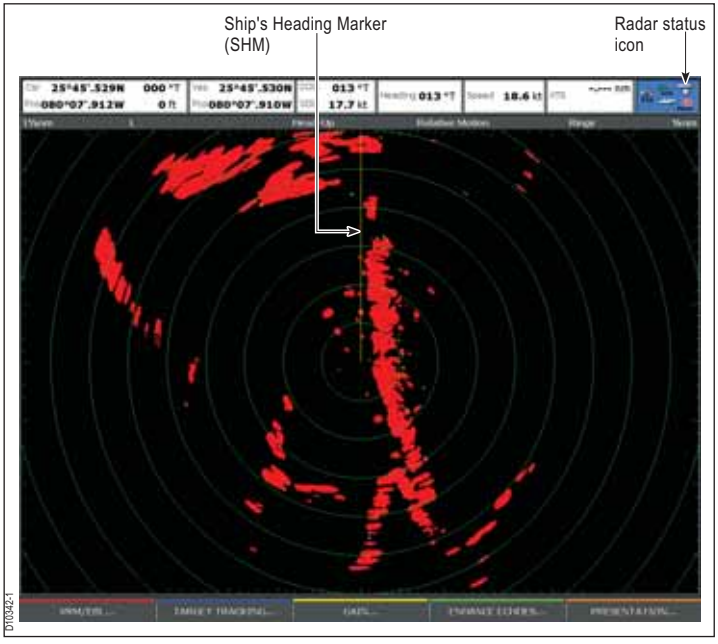
To set radar to transmit

1. Press the Power button on the Keyboard.
2. Press the **RADAR TX/STDBY** softkey and set to **TX**.

Note: For 2 scanner systems there are individual **ON/OFF** and **TX/STDBY** keys for each scanner.

Check radar operation

Typical radar page



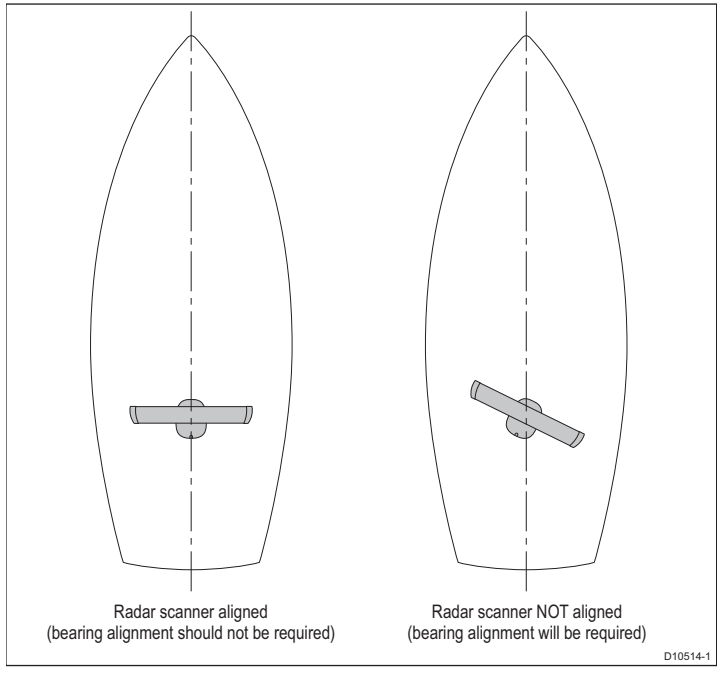
Points to check:

- Radar sweep with echo responses are shown on screen
- Radar status icon rotating in top right hand corner

If either of the above are not present this could indicate a fault. Refer to the radar troubleshooting section for information.

Check and adjust bearing alignment

Check and adjust the radar bearing alignment to ensure that radar objects appear at the correct bearing relative to your boat's bow. You will need to check the radar bearing alignment for any scanner installation that is not aligned with the boat.



Note: Bearing alignment should only be done after the compass heading has been checked (*page 82*).

To check the bearing alignment

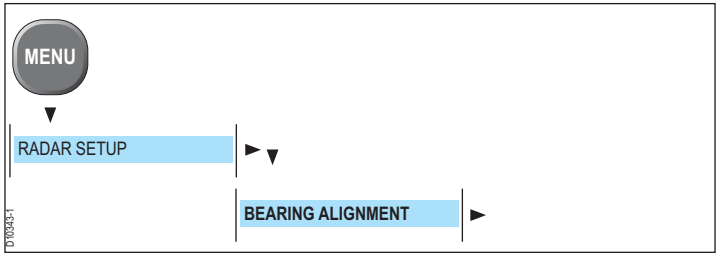
With your boat under way:

1. Align your boat's bow with a stationary object identified on the Radar display
   An object between 1 & 2 NM distant is ideal.

2. Note the position of the object on the radar display. If the target is not under the Ships heading marker (SHM), there is an alignment error and you will need to carry out bearing alignment adjustment.

To adjust the bearing alignment

With a radar window active select the bearing alignment menu:



From the menu:

1. Press the **BEARING ALIGNMENT** softkey.
2. Use the rotary control to place the selected target under the SHM.
3. Press **OK** when complete.

Parking settings (open array scanners)

To ensure the scanner parks (rests) in the correct position when rotation stops, you may need to adjust the radar offset angle.

To adjust radar parking settings

From the Radar setup menu (radar in standby mode):

1. Select the **PARKING OFFSET** option, then adjust the offset angle required to park the radar so that the antenna comes to rest facing forward (you should see the Raymarine logo wording from the front of the boat) when you place it in either standby or switch it off.
2. Press **OK** when complete.

8.4 GPS checks

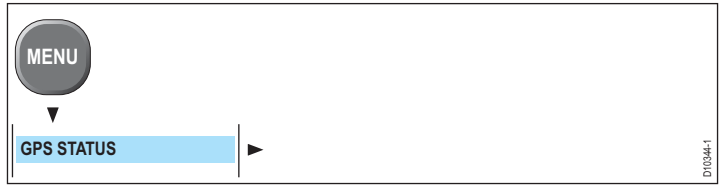
The GPS is required to show your boat position on the chart. You can set up your GPS and check its status using the GPS status icons and the GPS Status page of the Setup menu.

Check the GPS Status icon

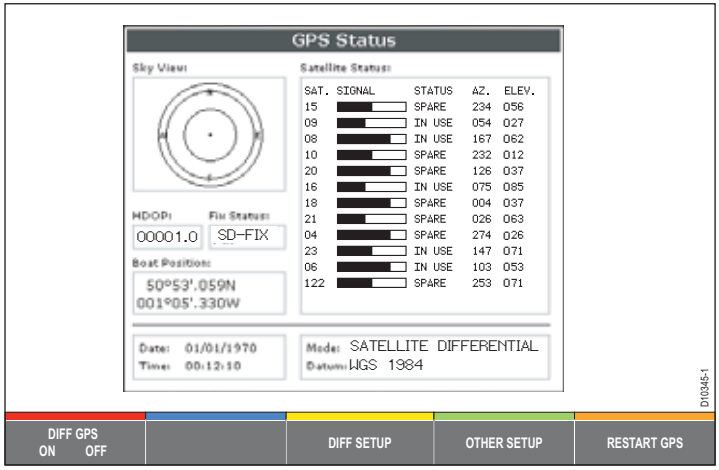
This is located in the top right hand corner of the screen.

If NO FIX is displayed refer to the GPS status page (below) and Troubleshooting section on *page 95*.

GPS Status page



Typical GPS status screen



This screen may help diagnose a NO FIX status. It provides information for each for each tracked GPS satellite.

HDOP

The HDOP (Horizontal Dilution Of Position) value shown on screen provides an indication of the positional accuracy. This will vary depending upon the relative position of the GPS satellites and the prevailing conditions.

An ideal figure is 1.0. which indicates optimum accuracy.

A consistently high value (6 or above) may be associated with NO-FIX occurring frequently. Check that the GPS antennae has a clear view of the entire sky and refer to the troubleshooting section on *page 95*.

See also

For further information and details regarding differential GPS, refer to the separate user reference manual.

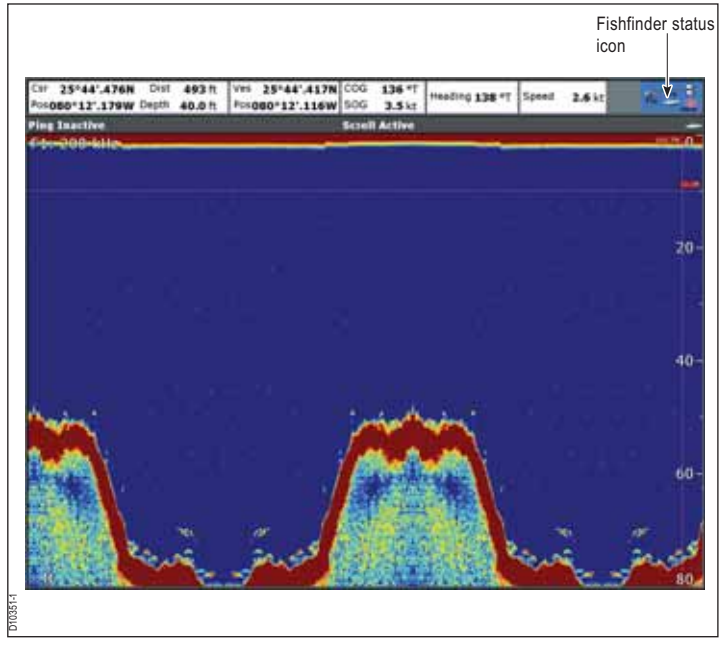
8.5 Fishfinder checks

For the fishfinder window to function the system must be connected to a digital sounder (e.g. DSM400).

To select a fishfinder screen:

- Press the **PAGE** key to select from the current page set.
- Press and hold the **PAGE** key to select from all available screens.

Typical fishfinder screen



Points to check:

- Fishfinder screen is scrolling and showing graphical information.
- FIshfinder status icon animated in top right hand corner.

- Valid depth and frequency values on screen

If any of the above are not present this could indicate a fault. Refer to Chapter 9: Troubleshooting. Page 91.

Fault indications:

No Data
This is displayed if the system cannot detect a compatible DSM sounder with appropriate transducer.

Invalid custom configuration
Indicates an invalid manual override of switch settings at the transducer. Refer to your DSM and Transducer documentation for further information.

8.6 Set up video

To ensure correct operation of the video and entertainment system you should setup and test all video and audio channels.

Before proceeding ensure that the video sources are operating. For audio you should ensure that the amplifier is turned on with the appropriate input selected.

Check the video and audio output

You will need to:

- Set up and select a video page
- Set up the video inputs

To set up a video page

1. Open the system **Setup** menu.
2. Open the **Select Page Set** screen.
3. Highlight the page set you want to edit.
4. Press the **EDIT PAGE SET** softkey:
5. Follow the on-screen instructions and select the video page type as appropriate.
6. Press **OK**.

To select a video page

- Press the **PAGE** key to select from the current page set.
  OR
- Press and hold the **PAGE** key to select from all available page sets.

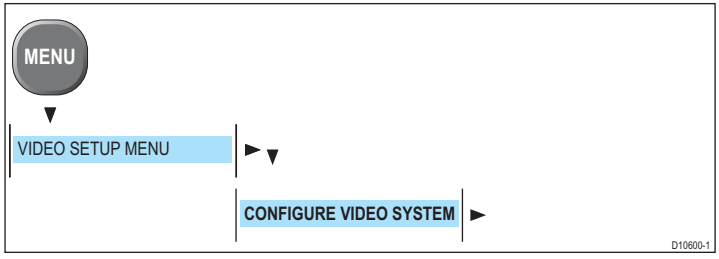
The audio (associated with input 4) will be heard through the connected amplifier or television.

To set up video inputs

This menu provides the following options:

- **Setup video cycle**
  You may set up display cycles for multiple video sources.
- **Setup softkey shortcuts**
  You can set up the softkeys used to view the video channels on the monitor.
- **Configure video system**
  Set up S-Video and other video options (S-Video is only available on input 4). See Configure the video system .
- **Reset GVM**
  Reset all options associated with the GVM400 video server(s) to the factory default settings.

Configure the video system



Select the required video input, then adjust the following options as required:

- **Rename GVM400 video unit**
  By default, the GVM video modules are labelled by their serial number, e.g. “GVM400-0471123”. You can change these labels to make them more descriptive.
- **Rename video**
  By default, the video sources are labelled ‘Comp1’ to ‘Comp3’ and ‘S-Video’. You can change these labels to make them more descriptive, for example: ’engine room’, ‘stern’, or ‘bow’.
- **Type (Input 4 only)**
  By default input 4 is set to S-Video. If you want to use input 4 for composite video, change this setting accordingly.
- **Orientation**
  Use this option to change the orientation of the video image. For example to display a mirror-image of the video feed if you have a rear-facing camera linked to a forward-facing display.
- **Aspect ratio**
  The video application automatically detects the appropriate aspect ratio for each input source. If an image appears distorted (squashed or stretched), you can override the automatic setting to choose the appropriate aspect ratio manually.
  An aspect ratio of 4:3 is standard format, while 16:9 is wide-screen format.

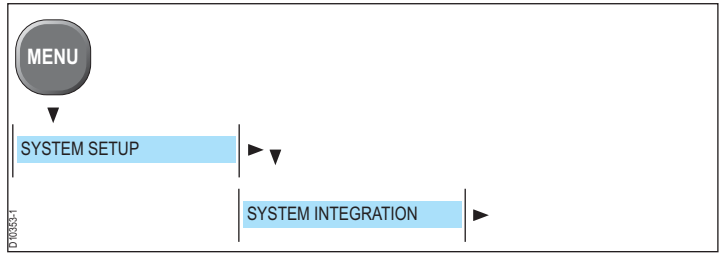
See also

- Please refer to the Reference Manual for more details.
- If any channel does not display correctly check the video and SeaTalk^{hs} connections. Also refer to Chapter 9: Troubleshooting

8.7 NMEA 0183

If you have a Navtex or AIS receiver connected to a NMEA 0183 port, you will need to change the NMEA Port Setting.

Set up the NMEA port using a monitor physically connected to the correct GPM400 processor. (Refer to the details on your Nav Station schematic diagrams)



NMEA Port settings

Setting	NMEA equipment	Additional information
NMEA 4800	General	Default setting
Navtex 4800 or Navtex 9600	Navtex receiver	Please refer to your Navtex receiver manual for appropriate settings.
AIS 38400	AIS receiver	

AIS checks

1. Check the AIS Status icon

This is located in the top right hand corner of the screen.

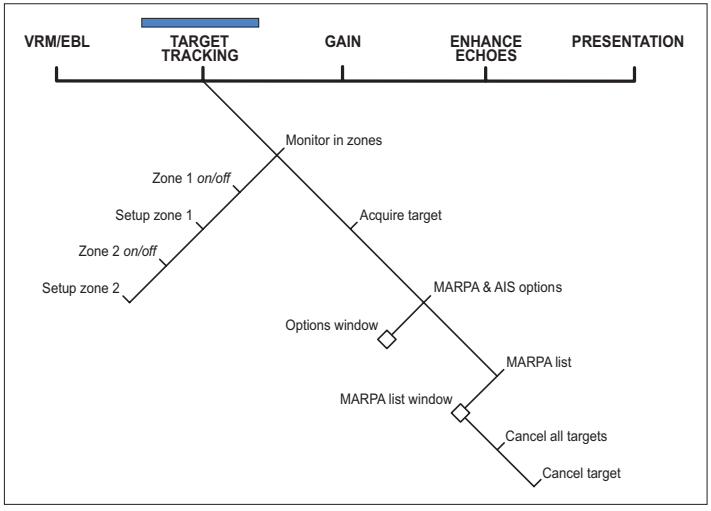
If NO AIS is displayed, please refer to the Troubleshooting section on *page 97*.

2. Check that AIS targets are available

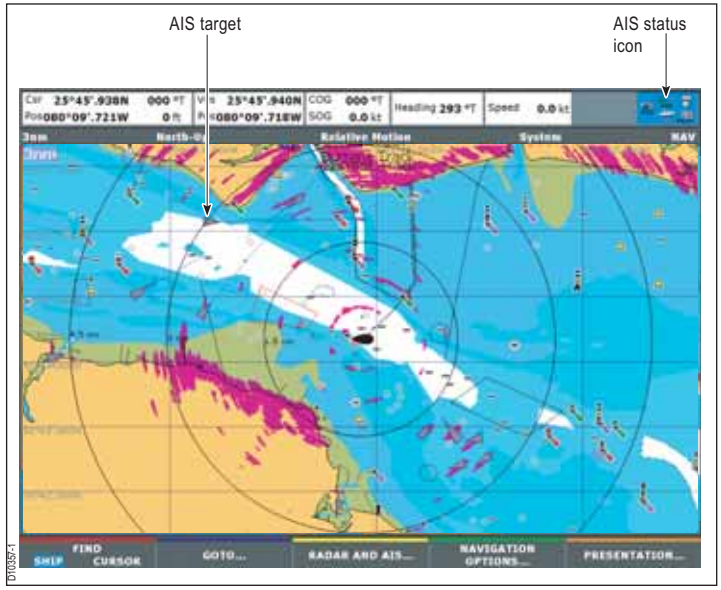
Use the chart window with radar overlay to check the AIS operation.

Note: For dockside or dry-dock commission, you may not see targets.

Use these softkey functions to view AIS targets



Typical AIS window



8.8 Data checks

Use the data window to check that the G-Series system is receiving all necessary information from the marine electronics system. This includes:

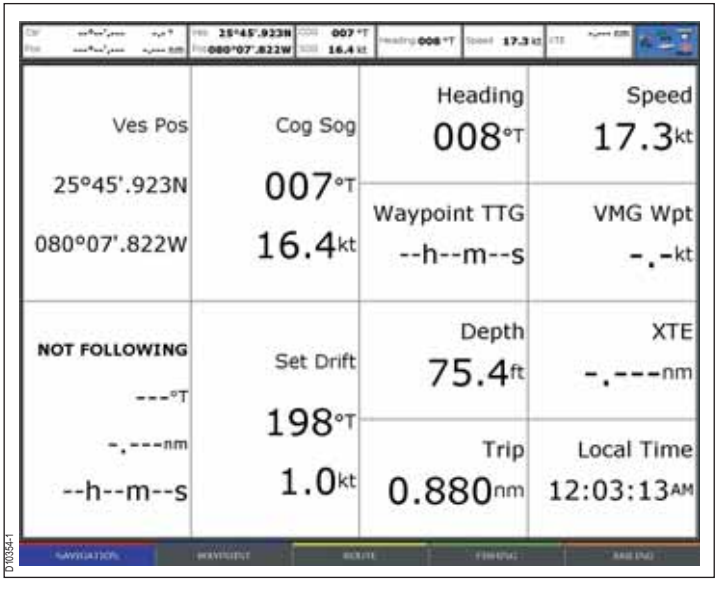
- Instrument and other data received via SeaTalk^{ng}.
- Engine data. Compatible engines may send information using NMEA 2000. This can be then connected into the SeaTalk^{ng} bus.
- Other data on the system (e.g. received via SeaTalk and NMEA 0183).

To select the digital data page

- Press the **PAGE** key to select from the current page set.

- Press and hold the **PAGE** key to select from all available pages.

Typical instrument data window



To set up the digital data to be displayed

Open the Panel Setup Menu

Use this menu to add or remove types of data from the display.
Refer to the user reference manual for additional information.

Chapter 9: Troubleshooting

9

This section gives details for the troubleshooting the system. It covers common problems that may occur during test and commissioning.

Chapter contents

- Power up on page 92
- Marine Monitors on page 92
- Keyboards on page 93
- Radar on page 94
- GPS on page 95
- Video on page 96
- Data on page 97
- Fishfinder on page 98
- SeaTalk^{hs} Switch LED indications on page 98
- GPM400 LED indications on page 99
- GVM400 LED indications on page 100
- DSM400 LED indications on page 100

9.1 Troubleshooting

Power up

Problem	Possible causes	Possible solutions
• The system (or part of it) does not power up.	• Power supply problem	• Check relevant fuses and breakers.
		• Check that the power supply cable is sound and that all connections are tight and free from corrosion.
		• Check that the power source is of the correct voltage and sufficient current.

Marine Monitors

Problem	Possible causes	Possible solutions
• Monitor is blank.	• The monitor is in standby mode.	• Press the standby/power key on the monitor.
	• The monitor has no power supply.	• Refer to troubleshooting Power up on page 92.
• Monitor shows “Searching” or “No signal” message.	• A repeat monitor during system start-up	• Wait for a couple of minutes and see if the problem clears.
	• The monitor is set to an incorrect input channel.	• Press the channel select keys on the monitor to check all input channels.
	• A faulty connection to the GPM400 processor	• Check the cable/connection between the monitor and the GPM400 processor.
	• The GPM400 processor is not operating correctly.	• Check the GPM400 power supply. Refer to troubleshooting Power up on page 92. • Check the GPM400 status LEDs. Refer to troubleshooting GVM400 LED indications on page 100.
• Monitor picture is out of proportion	• GPM has 2 monitors with different screen resolutions • GPM has 2 monitors with different aspect ratio	• Ensure that monitors connected to a single GPM have the same screen resolution and aspect ratio.
• Monitor resolution is incorrect (display looks pixelated or stretched/squashed)		

Problem	Possible causes	Possible solutions
• The keyboard does not operate monitor setting menus. • On or more monitors are not listed when configuring the monitors or Nav Stations.	• SeaTalk^{hs} network problem	• Check the status of the SeaTalk^{hs} Switch. Refer to troubleshooting SeaTalk^{hs} Switch LED indications on page 98
		• Check the marine monitor and ensure that the network selector switch is in the “up” position (required when connected to the SeaTalk^{hs} network).
		• Check that the monitor and GPM400 are both connected to the SeaTalk^{hs} switch.
		• Check that SeaTalk^{hs} cables are free from damage.
	• The monitor is not a Raymarine G-Series unit.	• Only G-Series marine monitors are compatible with the SeaTalk^{hs} network required for this functionality.
	• Software mismatch between equipment may prevent communication.	• Contact Raymarine technical support

Keyboards

Problem	Possible causes	Possible solutions
• Keyboard LCD is blank. • (Monitor may also show no keyboards connected message)	• The Keyboard is not connected to SeaTalk^{ng} or has no power.	• Check keyboard wiring and power to SeaTalk^{ng} bus.
	• Wireless keyboard is not charged up.	• Connect wireless keyboard to charge point.
Keyboard LCD shows low battery	• Wireless keyboard battery requires charging • Degraded / old keyboard battery requires replacing	• Charge keyboard battery at appropriate charge point. • Replace battery
• Keyboard LCD shows sw version message. e.g 86/78 F64D V0.6A • (Monitor may also show no keyboards connected message)	• The Keyboard cannot communicate with a GPM400 processor	• Ensure GPM400 processors are connected to the SeaTalk^{ng} system.
	• Wireless basestation is not operating or is disconnected from SeaTalk^{ng}.	• Check power and connections to SeaTalk^{ng} wireless basestation.
	• Wireless basestation is out of range	• Re-survey wireless coverage and move / add repeat basestations if necessary.

Problem	Possible causes	Possible solutions
• Keypresses result in improper or no action at the display.	• Software mismatch between equipment may prevent communication.	• Contact Raymarine technical support
• Keyboard does not control the expected monitor or Nav Station.	• Keyboard is not assigned to the correct Nav Station(s).	• Assign keyboard to Nav station (see Assign Keyboards on page 78).
	• Incorrect monitor is selected at Keyboard	• Check the Keyboard LCD to see which monitor is currently being used. Use the left/right arrow keys to select between the available monitors.
• Keyboard does not operate monitor setting menus.	• Refer to troubleshooting Marine Monitors on page 92	

Radar

Problem	Possible causes	Possible solutions
• No Data or No scanner message.	• Radar scanner power supply	• Check that the scanner power supply cable is sound and that all connections are tight and free from corrosion.
		• Check relevant fuses and breakers.
		• Check power source is of the correct voltage and sufficient current (using voltage booster if appropriate).
	• SeaTalk^{hs} network problem	• Check that all radar scanners are correctly connected to the SeaTalk^{hs} switch.
		• Check the status of the SeaTalk^{hs} Switch. Refer to troubleshooting Status LEDs on page 98.
		• Check that SeaTalk^{hs} cables are free from damage.
	• Radar scanner fault	• Refer to the radar scanner handbook.
	• Software mismatch between equipment may prevent communication.	• Contact Raymarine technical support

Problem	Possible causes	Possible solutions
• Radar will not initialize (Voltage control module (VCM) stuck in “sleep mode”)	• Intermittent or poor power connection.	• Check power connection at VCM. (Voltage at input = 12 V, Voltage at output = 40 V)
	• Switch at scanner pedestal in OFF position.	• Ensure scanner pedestal switch is in ON position.
• The bearing given on the radar window differs from the actual bearing.	• The radar bearing alignment requires correcting.	• Perform the bearing alignment procedures. (See Check and adjust bearing alignment on page 84).

GPS

Problem	Possible causes	Possible solutions
• “No Fix” GPS status icon is displayed.	• GPS equipment fault	• Ensure that the GPS is functioning correctly (refer to manufacturers handbook).
	• GPS connection fault	• Ensure that GPS connections and cabling are correct.
	• GPS antenna in poor position • GPS installation problem	• Ensure GPS antenna has a clear view of the sky. • Refer to manufacturers handbook for installation details.
	• Geographic location or prevailing conditions preventing satellite fix.	• Check periodically to see if a fix is obtained in better conditions or another geographic location.

Video

Problem	Possible cause / solution	Possible solutions
Video picture is unavailable at some or all Nav stations.	• Video signal is not reaching the GVM400 video module.	• Check the video source equipment.
		• Check the video connections to the GVM400 unit.
	• GVM400 video module or power supply problem.	• Check the GVM400 status. See troubleshooting GVM400 LED indications on page 100.
		• Check the GVM400 power supply. Refer to troubleshooting Power up on page 92.
	• SeaTalk^{hs} network problem	• Check that all GVM400 and all GPM400s are connected to the SeaTalk^{hs} switch.
		• Check the status of the SeaTalk^{hs} Switch. Refer to troubleshooting Status LEDs on page 98
		• Check that SeaTalk^{hs} cables are free from damage.
	• Software mismatch between equipment may prevent communication.	• Contact Raymarine technical support

Data

Problem	Possible cause / solution	Possible solutions
• Instrument or other system data is unavailable at all Nav Stations.	• Data not received at Master GPM.	• Check the data bus (e.g. SeaTalk^{ng}) wiring and connection to the master GPM.
		• Check the overall integrity of the data bus (e.g. SeaTalk^{ng}) wiring.
		• If available refer to the reference guide for the data bus. (e.g. SeaTalk^{ng} reference manual)
	• Data source (e.g ST70 instrument) is not operating.	• Check the source of the missing data (e.g. ST70 instrument)
		• Refer to the manufacturers handbook for the equipment in question.
	• Software mismatch between equipment may prevent communication.	• Contact Raymarine technical support
• Instrument or other system data is missing from some but not all Nav Stations.	• SeaTalk^{hs} network problem	• Check that all GPM400s are connected to the SeaTalk^{hs} switch.
		• Check the status of the SeaTalk^{hs} Switch. Refer to troubleshooting Status LEDs on page 98.
		• Check that SeaTalk^{hs} cables are free from damage.
	• Software mismatch between equipment may prevent communication.	• Contact Raymarine technical support

Fishfinder

• Problem	• Possible cause / solution	• Possible solutions
• No data source for the fishfinder.	• DSM power supply fault.	• Check the DMS power supply. Refer to troubleshooting Power up on page 92.
	• Other DSM fault.	• Refer to the instructions supplied with the DSM unit.
	• SeaTalk^{hs} network problem.	• Check that the DSM is correctly connected to the SeaTalk^{hs} switch.
		• Check the status of the SeaTalk^{hs} Switch. Refer to troubleshooting Status LEDs on page 98.
		• Check that SeaTalk^{hs} cables are free from damage.
	• Software mismatch between equipment may prevent communication.	• Contact Raymarine technical support
• Invalid custom configuration message	• Indicates an invalid manual override of switch settings at the transducer	• Refer to your DSM and Transducer documentation for further information

9.2 Status LEDs

SeaTalk^{hs} Switch LED indications

LED State (Connected channels only)	Causes
• For all connected channels: 1 steady and 1 flashing green LED.	• No problem detected (Steady LED indicates network connection Flashing LED indicates network traffic)
• No LEDs are illuminated	• No power to SeaTalk^{hs} switch
• Some LEDs are not illuminated	• Cable / connection faults on the channels with non-illuminated LEDs. • Equipment connected to non-illuminated LEDs may be faulty.

GPM400 LED indications

Color	Operation	Causes
Normal operation		
Green	Flashing 500 / 500 ms	• Normal operation (Heartbeat)
Green	Flashing 750 / 250ms	• Standby mode
Warnings and Errors		
Off	Off < 2 minutes Off for > 2 minutes	• Startup • No power
		•
Amber	On steady	• Power on • Lamp test
Amber	Flashing x 1	• No link between processors (network fault)
Amber	Flashing x 2	• No network / cable unplugged
Amber	Flashing x 3	• Over temperature warning
Amber/Green	Alternating 750/250 ms	• Bootloader awaiting to be upgraded or downloading code
Amber/Red	Alternating 750/250 ms	• DOBII Download. This condition remains until a valid application is available from Flash
Red	Flashing x 1	• Fan fault
Red	Flashing x 3	• Over temperature error
Red	Flashing x 4	• Flash write error
Red	Flashing x 5	• No application programmed
Red	Flashing x 8 (May be followed by Flashing amber)	• Hardware fault

GVM400 LED indications

Color	Operation	Causes
Normal operation		
Green	Flashing (various rates, depending upon system data)	• Normal operation
Warnings and Errors		
Amber	On steady	• Power on • Lamp test
Amber	Flashing x 1	• Acquisition failure
Amber	Flashing x 2	• No network / cable unplugged
Amber	Flashing x 3	• Other network error
Amber/Red	Alternating 750/250 ms	• Software upgrade. This condition remains until a valid application is available from Flash
Red	Flashing x 1	• Unit can no longer poll input status
Red	Flashing x 4	• Flash write error
Red	Flashing x 6	• Video stopped
Red	Flashing x 7	• Video error
Red	Flashing x 8 (May be followed by Flashing amber)	• Hardware read failure

DSM400 LED indications

Color	Operation	Causes
Normal operation		
Green	Flashing 500 / 500 ms	• Normal operation (Heartbeat)
Green	Flashing 750 / 250ms	• Standby mode

Color	Operation	Causes
Warnings and Errors		
Off	Off < 2 minutes Off for > 2minutes	• Startup • No power
		•
Amber	On steady	• Power on • Lamp test
Amber	Flashing x 1	• Input transducer
Amber	Flashing x 2	• No network / cable unplugged
Amber	Flashing x 3	• Over temperature warning
Amber	Flashing x 8	• Watchdog restart
Amber/Red	Alternating 750/250 ms	• Software upgrade. This condition remains until a valid application is available from Flash
Red	Flashing x 1	• Voltage error
Red	Flashing x 3	• Over temperature error
Red	Flashing x 4	• Flash write error
Red	Flashing x 5	• No application programmed
Red	Flashing x 8 (May be followed by Flashing amber)	• Hardware read failure

Appendix ATechnical specification

GPM400 Processor module

GPM400 Processor module	
Nominal supply voltage	12 V / 24 VDC
Operating voltage range	10.7 V to 32 V DC
Fuse / Breakers	12 V supply: 10 A fuse protection at distribution panel 10 A thermal circuit breaker protection at distribution panel 24 V supply: 4 A fuse protection at distribution panel 5 A thermal circuit breaker protection at distribution panel
Typical Power consumption	No external loads 3 A @ 12 V 1.5 A @ 24 V With external loads 5 A @ 12 V 2.5 A @ 24 V
Environmental conditions:	operating temperature: -15°C to 55°C (5°F to 131°F) non-operating temperature: -25°C to 70°C (-13°F to 158°F) relative humidity limit: 80% water protection: drip resistant when mounted vertically
Storage conditions for packaged unit:	Temperature: -25°C to 55°C (-13°F to 158°F) relative humidity: 75%

GPM400 Processor module	
Dimensions:	Width = 335 mm (13.19 in) Height =230 mm (9.06 in) Depth = 125 mm (4.92 in),
Weight	6.5 kg (14.33 lb)
Data connections	NMEA 0183 (x2) SeaTalk SeaTalk^{ng} SeaTalk^{hs} Compact flash USB (software upgrade only)
Video	DVI x 2 (Optional VGA adaptor available)
Audio	Stereo line out (rated 1 V rms)
SeaTalk / alarm power output	250 mA at 12 V
CE approvals - conforms to:	89/336/EEC as amended by 92/31/EEC, EN60945:2002

GVM400 Video module

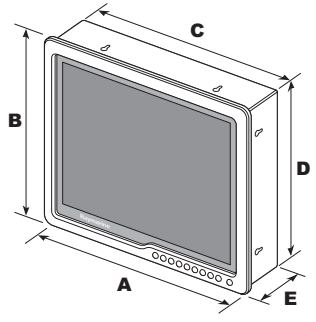
GVM400 Video module	
Nominal supply voltage	12 V / 24 V DC
Operating voltage range	10.7 V to 32 V DC
Fuse / Breakers	12 V supply: 2 A fuse protection at distribution panel 1.2 A thermal circuit breaker protection at distribution panel 24 V supply: 1 A fuse protection at distribution panel 1 A thermal circuit breaker protection at distribution panel
Typical Power consumption	650 mA @ 12 V 330 mA @ 24 V
Environmental conditions:	operating temperature: -15°C to 55°C (5°F to 131°F) non-operating temperature: -25°C to 70°C (-13°F to 158°F) relative humidity limit: 80% water protection: drip resistant when mounted vertically
Storage conditions for packaged unit:	Temperature: -25°C to 55°C (-13°F to 158°F) relative humidity: 75%
Dimensions:	Width = 237 mm (9.33 in) Height = 170 mm (6.69 in) Depth = 56 mm (2.20 in)
Weight	0.8 kg (1.76 lb)
Data connections	SeaTalk^{hs}

GVM400 Video module	
Video inputs	Inputs 1-3: Composite video (PAL 626 Line, NTSC 525 Line) Input 4: S-Video or Composite video
Audio inputs	Stereo audio line in (rated 1 V rms) (associated with Input 4 (S-Video or composite)
CE approvals - conforms to:	89/336/EEC as amended by 92/31/EEC, EN60945:2002

G-Series Keyboard

G-Series Keyboard	
Nominal supply voltage	12 V DC (From SeaTalk^{ng}bus)
Operating voltage range	9 V to 16 V DC
Power consumption (standby)	1.5 W
Environmental conditions:	operating temperature: -15°C to 55°C (5°F to 131°F) non-operating temperature: -25°C to 70°C (-13°F to 158°F) relative humidity limit: 95% water protection: waterproof to CFR-46 standard
Storage conditions when packed:	Temperature: -25°C to 55°C (-13°F to 158°F) relative humidity: 75%
Dimensions:	(width, height, depth) 297 mm (11.69 in), 98 mm (3.86 in), 46 mm (1.81 in)
Weight	0.65 kg (1.43 lb)
Data connections	SeaTalk^{ng} SeaTalk^{ng} RF (requires wireless upgrade kit and separate basestation)
Approvals:	CE: • EN60945, EN300-440-2 FCC: • CFR47 PART 15 Other • IC-RSS-210

G-Series marine monitors



Display	Dimensions - mm (in)				
	A	B	C	D	E
G120 - 12 inch	330 (13.00)	284 (11.18)	307 (12.08)	257 (10.10)	118 (4.64)
G150 - 15 inch	380 (14.97)	315 (12.39)	357 (14.07)	292 (11.50)	118 (4.64)
G170 - 17 inch	415 (16.34)	358 (14.10)	394 (15.51)	335 (13.19)	100 (3.94)
G190 - 19 inch	454 (17.87)	389 (15.31)	432 (17.00)	366 (14.41)	100 (3.94)

G-Series marine monitors	
Nominal supply voltage	12 V / 24 V DC
Operating voltage range	10.2 V to 32 V DC
Power consumption (standby)	G170 - 7.6 amps at 12 V 3.5 amps at 24 V G190 - 7.7 amps at 12 V 3.6 amps at 24 V
Environmental conditions:	operating temperature: -10°C to 50°C (14°F to 122°F) non-operating temperature: -20°C to 70°C (-4°F to 158°F) water protection: waterproof to IP66 (from the front)
Storage conditions when packed:	Temperature: -25°C to 55°C (-13°F to 158°F) relative humidity: 75%
Dimensions:	Refer to separate operators handbook for model dimensions

G-Series marine monitors	
Weight	G120 - 4.6 kg (10 lbs) G150 - 5.8 kg (12 lbs) G170 - 6.4 Kg (14 lbs) G190 - 7.3 Kg (16 lbs)
Video inputs	3 VGA 2 DVI-D 3 Composite video 1 S-Video
Data connections	SeaTalk^{hs}/Ethernet Serial Port
Native resolution	G120 / G150: 1024 x 768 (XGA) G170 / G190: 1280 x 1024 (SXGA)

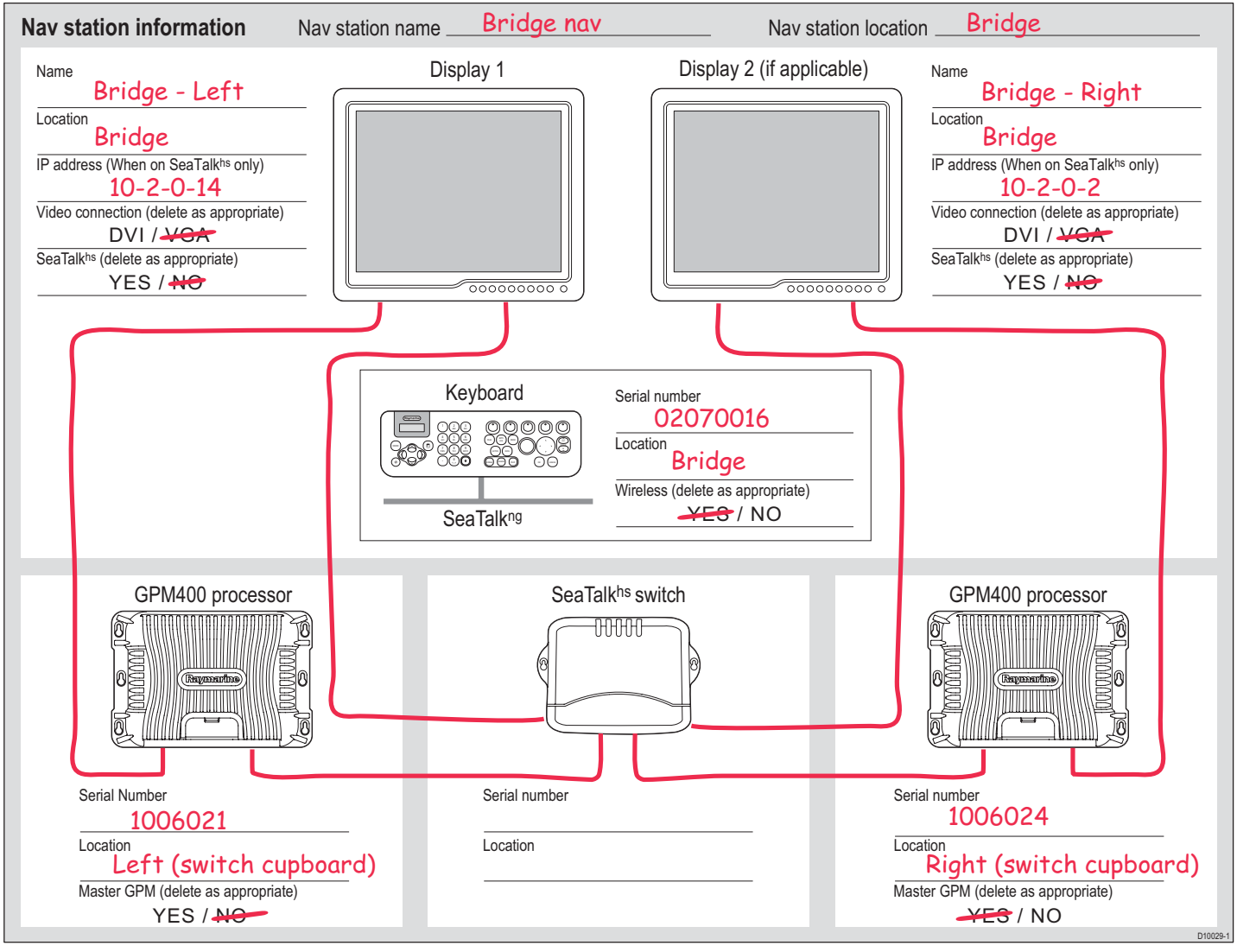
G-Series marine monitors	
Resolutions and refresh rates	VGA - 60,72, 75 and 85 Hz SVGA - 56, 60, 72, 75 and 85 Hz XGA - 60, 70, 75 and 85 Hz SXGA - 60, 75 and 85 Hz UXGA - 60, 65, 70, 75 and 85 Hz All timings in accordance with VESA Monitor Timing Standards
Approvals:	CE: • 1999/5/EC, EN60945:2002 FCC: • Part 80 (47CFR) and Part 2 (47CFR)

See also

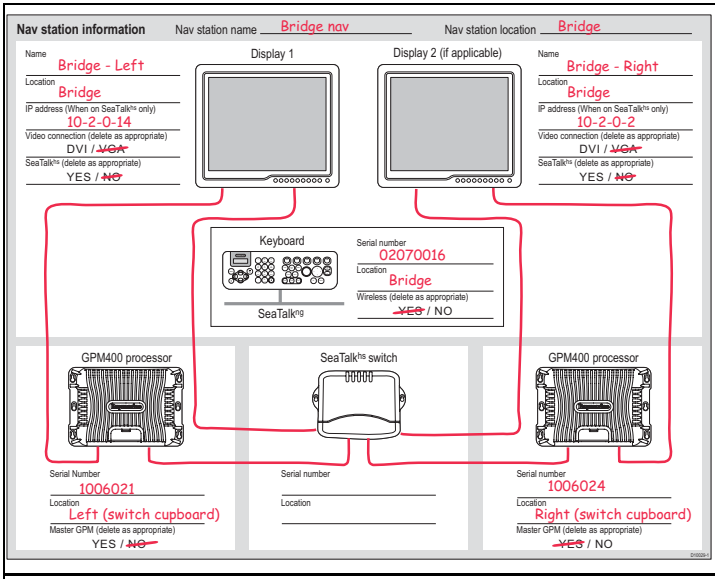
- For additional specifications, refer to the documentation supplied with the individual equipment.

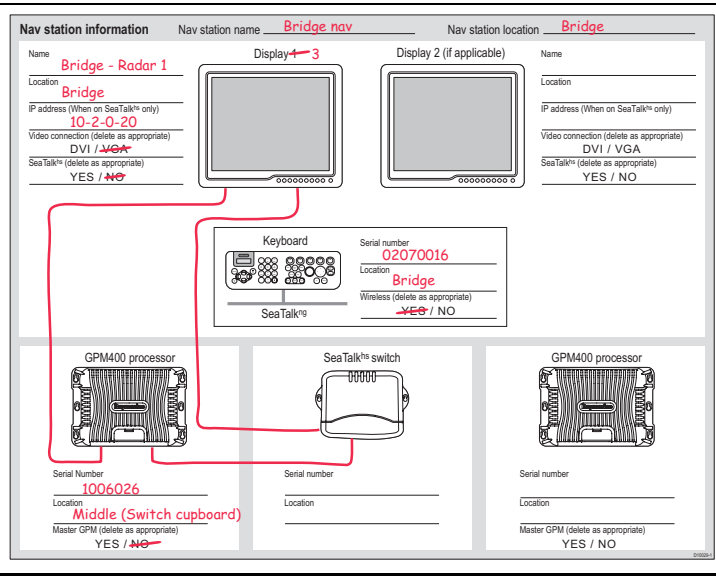
Appendix B - Nav Station schematic

Plan the connections and arrangement of your core system. This information is required when commissioning.



If required use multiple sheets, as shown in the example system below.





Example notes:

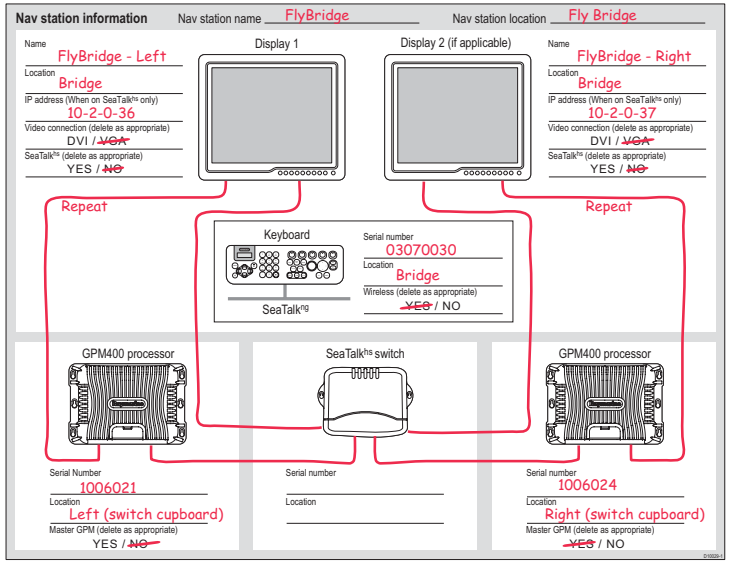
Bridge (Above)

- 3 displays all controlled by a single keyboard.

Flybridge (Right)

- 2 repeat displays with a single keyboard.

In this example system, the flybridge does not repeat the dedicated radar display used on the bridge.



Nav station information

Nav station name _____ Nav station location _____

Name

Location

IP address (When on SeaTalk^{hs} only)

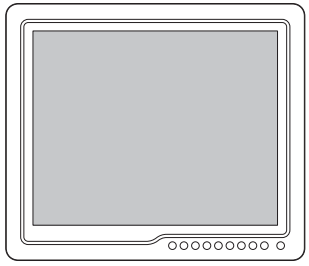
Video connection (delete as appropriate)

DVI / VGA

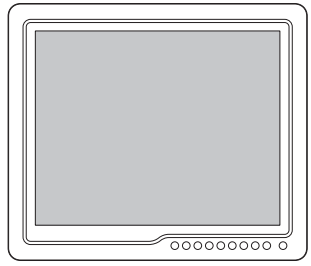
SeaTalk^{hs} (delete as appropriate)

YES / NO

Display 1



Display 2 (if applicable)



Name

Location

IP address (When on SeaTalk^{hs} only)

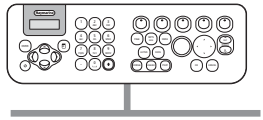
Video connection (delete as appropriate)

DVI / VGA

SeaTalk^{hs} (delete as appropriate)

YES / NO

Keyboard



SeaTalk^{ng}

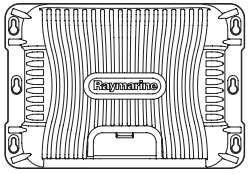
Serial number

Location

Wireless (delete as appropriate)

YES / NO

GPM400 processor



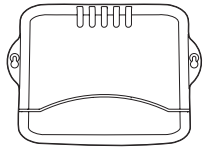
Serial Number

Location

Master GPM (delete as appropriate)

YES / NO

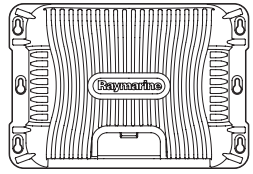
SeaTalk^{hs} switch



Serial number

Location

GPM400 processor



Serial number

Location

Master GPM (delete as appropriate)

YES / NO

D10029-1

Nav station information

Nav station name _____ Nav station location _____

Name

Location

IP address (When on SeaTalk^{hs} only)

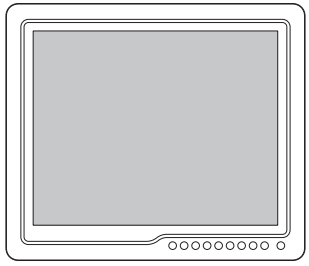
Video connection (delete as appropriate)

DVI / VGA

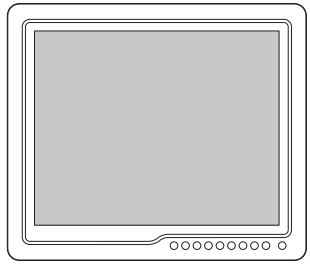
SeaTalk^{hs} (delete as appropriate)

YES / NO

Display 1



Display 2 (if applicable)



Name

Location

IP address (When on SeaTalk^{hs} only)

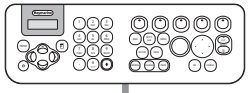
Video connection (delete as appropriate)

DVI / VGA

SeaTalk^{hs} (delete as appropriate)

YES / NO

Keyboard



SeaTalk^{ng}

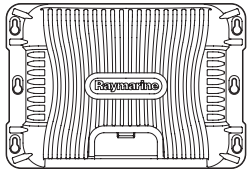
Serial number

Location

Wireless (delete as appropriate)

YES / NO

GPM400 processor



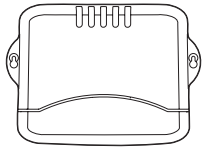
Serial Number

Location

Master GPM (delete as appropriate)

YES / NO

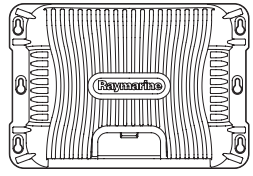
SeaTalk^{hs} switch



Serial number

Location

GPM400 processor



Serial number

Location

Master GPM (delete as appropriate)

YES / NO

D10029-1

Nav station information

Nav station name _____ Nav station location _____

Name

_____

Location

_____

IP address (When on SeaTalk^{hs} only)

_____

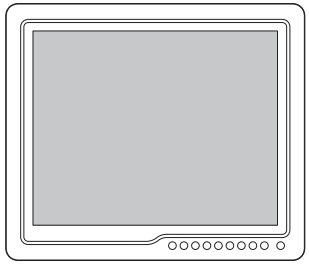
Video connection (delete as appropriate)

DVI / VGA

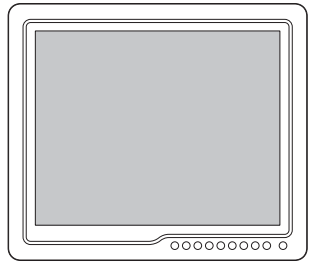
SeaTalk^{hs} (delete as appropriate)

YES / NO

Display 1



Display 2 (if applicable)



Name

_____

Location

_____

IP address (When on SeaTalk^{hs} only)

_____

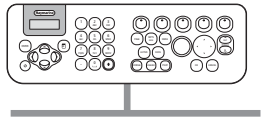
Video connection (delete as appropriate)

DVI / VGA

SeaTalk^{hs} (delete as appropriate)

YES / NO

Keyboard



SeaTalk^{ng}

Serial number

_____

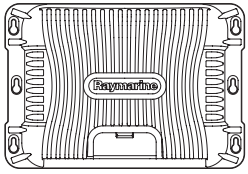
Location

_____

Wireless (delete as appropriate)

YES / NO

GPM400 processor



Serial Number

_____

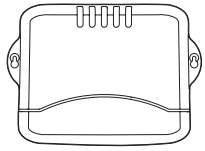
Location

_____

Master GPM (delete as appropriate)

YES / NO

SeaTalk^{hs} switch



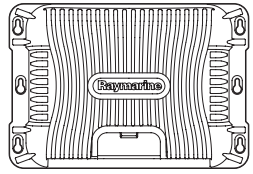
Serial number

_____

Location

_____

GPM400 processor



Serial number

_____

Location

_____

Master GPM (delete as appropriate)

YES / NO

D10029-1

Nav station information

Nav station name _____ Nav station location _____

Name

Location

IP address (When on SeaTalk^{hs} only)

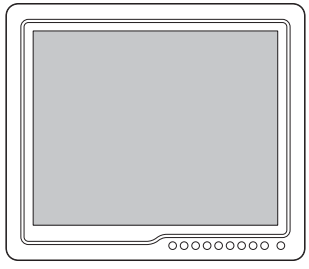
Video connection (delete as appropriate)

DVI / VGA

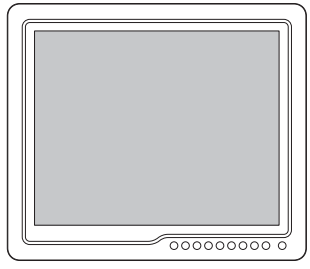
SeaTalk^{hs} (delete as appropriate)

YES / NO

Display 1



Display 2 (if applicable)



Name

Location

IP address (When on SeaTalk^{hs} only)

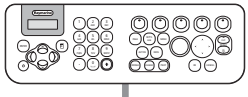
Video connection (delete as appropriate)

DVI / VGA

SeaTalk^{hs} (delete as appropriate)

YES / NO

Keyboard



SeaTalk^{ng}

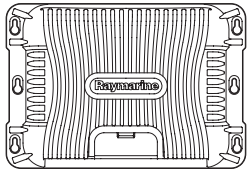
Serial number

Location

Wireless (delete as appropriate)

YES / NO

GPM400 processor



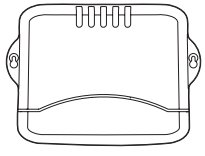
Serial Number

Location

Master GPM (delete as appropriate)

YES / NO

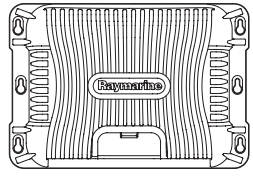
SeaTalk^{hs} switch



Serial number

Location

GPM400 processor



Serial number

Location

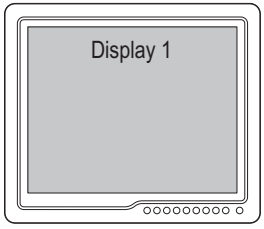
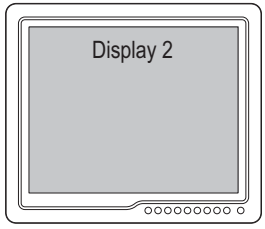
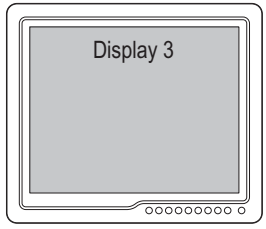
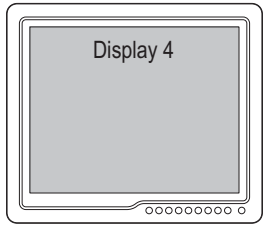
Master GPM (delete as appropriate)

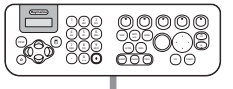
YES / NO

D10029-1

Nav station information

Nav station name _____ Nav station location _____

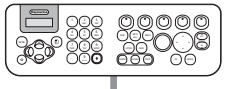
Name / Location	Name / Location	Name / Location	Name / Location
IP address (when on SeaTalk^{hs} only)	IP address (when on SeaTalk^{hs} only)	IP address (when on SeaTalk^{hs} only)	IP address (when on SeaTalk^{hs} only)
Video (delete as appropriate) DVI / VGA	Video (delete as appropriate) DVI / VGA	Video (delete as appropriate) DVI / VGA	Video (delete as appropriate) DVI / VGA
SeaTalk^{hs} (delete as appropriate) YES / NO	SeaTalk^{hs} (delete as appropriate) YES / NO	SeaTalk^{hs} (delete as appropriate) YES / NO	SeaTalk^{hs} (delete as appropriate) YES / NO
			
Display 1	Display 2	Display 3	Display 4



Serial Number _____

Location _____

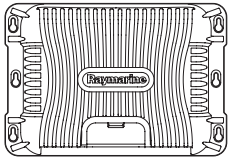
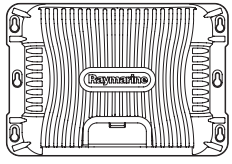
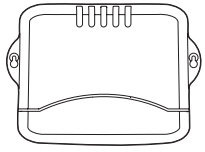
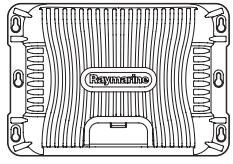
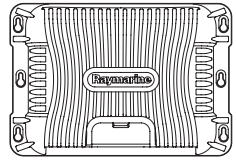
Wireless (delete as appropriate) YES / NO



Serial Number _____

Location _____

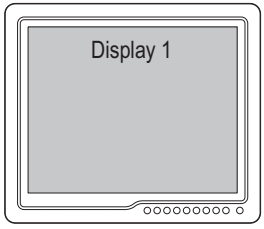
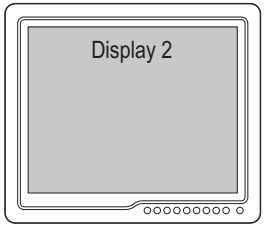
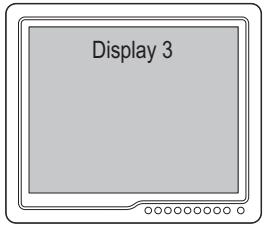
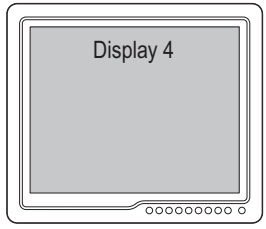
Wireless (delete as appropriate) YES / NO

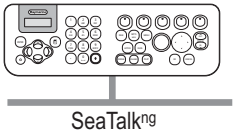
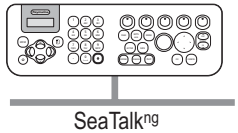
GPM400 processor	GPM400 processor	SeaTalk^{hs} switch	GPM400 processor	GPM400 processor
				
Serial Number _____	Serial Number _____	Serial Number _____	Serial Number _____	Serial Number _____
Location _____	Location _____	Location _____	Location _____	Location _____
Master GPM (delete as appropriate) YES / NO	Master GPM (delete as appropriate) YES / NO		Master GPM (delete as appropriate) YES / NO	Master GPM (delete as appropriate) YES / NO

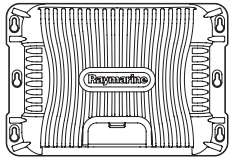
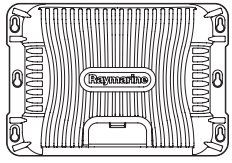
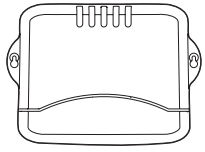
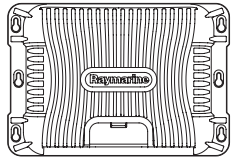
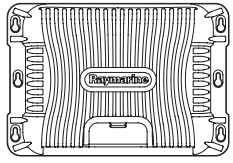
D10575-1

Nav station information

Nav station name _____ Nav station location _____

Name / Location	Name / Location	Name / Location	Name / Location
IP address (when on SeaTalk^{hs} only)	IP address (when on SeaTalk^{hs} only)	IP address (when on SeaTalk^{hs} only)	IP address (when on SeaTalk^{hs} only)
Video (delete as appropriate) DVI / VGA	Video (delete as appropriate) DVI / VGA	Video (delete as appropriate) DVI / VGA	Video (delete as appropriate) DVI / VGA
SeaTalk^{hs} (delete as appropriate) YES / NO	SeaTalk^{hs} (delete as appropriate) YES / NO	SeaTalk^{hs} (delete as appropriate) YES / NO	SeaTalk^{hs} (delete as appropriate) YES / NO
 Display 1	 Display 2	 Display 3	 Display 4

Keyboard	Keyboard
	
SeaTalk^{ng}	SeaTalk^{ng}
Serial Number _____	Serial Number _____
Location _____	Location _____
Wireless (delete as appropriate) YES / NO	Wireless (delete as appropriate) YES / NO

GPM400 processor	GPM400 processor	SeaTalk^{hs} switch	GPM400 processor	GPM400 processor
				
Serial Number _____	Serial Number _____	Serial Number _____	Serial Number _____	Serial Number _____
Location _____	Location _____	Location _____	Location _____	Location _____
Master GPM (delete as appropriate) YES / NO	Master GPM (delete as appropriate) YES / NO		Master GPM (delete as appropriate) YES / NO	Master GPM (delete as appropriate) YES / NO

D10575-1

Appendix C - Spares and accessories

Note: Parts marked with an asterisk * are supplied as standard with certain G-Series equipment. See Chapter 3: Packs and contents. Page 23 for details.

Cables

The following cables are available as accessories:

Description	Part No.
Marine monitor cables	
5 m (16.4 ft) DVI to DVI (digital) cable	E06021
10 m (32.8 ft) DVI to DVI (digital) cable	E06022
500 mm (19.69 in) DVI to VGA (analogue) cable	E06053
1.5 m (4.9 ft) VGA to VGA cable	R08130
5 m (16.4 ft) VGA to VGA cable*	R08174*
10 m (32.8 ft) VGA to VGA cable	R08296
20 m VGA to VGA cable	R08297
SeaTalk	
1.5 m (4.9 ft) SeaTalk/Alarm Out cable*	E55054*
SeaTalk^{hs} cables	
1.5 m (4.9 ft) SeaTalk^{hs} network cable	E55049
5 m (16.4 ft) SeaTalk^{hs} network cable	E55050
10 m (32.8 ft) SeaTalk^{hs} network cable	E55051
15 m (49.2 ft) SeaTalk^{hs} network cable	A62135
20 m (65.6 ft) SeaTalk^{hs} network cable	E55052
1.5 m (4.9 ft) SeaTalk^{hs} patch cable	E06054
5 m (16.4 ft) SeaTalk^{hs} patch cable	E06055
10 m (32.8 ft) SeaTalk^{hs} patch cable	E06056
15 m (49.2 ft) SeaTalk^{hs} patch cable	A62136
20 m (65.6 ft) SeaTalk^{hs} patch cable	E06057
SeaTalk^{ng} cables / connectors	
400 mm (15.75 in) SeaTalk^{ng} backbone cable	A06033
400 mm (15.75 in) SeaTalk^{ng} spur cable	A06038
1 m (3.3 ft) SeaTalk^{ng} spur cable*	A06039*
3 m (9.8 ft) SeaTalk^{ng} spur cable	A06040
5 m (16.4 ft) SeaTalk^{ng} spur cable	A06041
1 m (3.3 ft) SeaTalk^{ng} spur cable (bare ends)	A06043
3 m (9.8 ft) SeaTalk^{ng} spur cable (bare ends)	A06044
SeaTalk^{ng} T-Piece connector*	A06028*
NMEA 2000 cables	
1.5 m (4.9 ft) SeaTalk^{ng} to DeviceNet male	A06046
NMEA 0183 cables	
1.5 m (4.9 ft) NMEA 0183 cable*	R08004*
Power cables	
1.5 m (4.9 ft) Power cable*	R08003*

Description	Part No.
Audio/Entertainment	
1.5 m (4.9 ft) GVM400 Audio cable*	R08275*
1.5 m (4.9 ft) GVM400 S-Video cable*	R08274*
3 m (9.8 ft) G-Series Audio out cable*	R08266*
15 m (49.2 ft) G-Series Audio out cable	R08298

Spare parts

Service and Maintenance

This product contains no user serviceable components. Please refer all maintenance and repair to authorized Raymarine dealers. Unauthorized repair may affect your warranty.

GPM400 processor module spares	
Description	Part No.
US Cartography Hard Drive	R08267
EU Cartography Hard Drive	R08268
ROW Cartography Hard Drive	R08269
Hard Drive Cable	R08270
COM Express CPU Module Assembly	R08271
GPM400 Baseboard	R08272
GPM400 Connector Panel Assembly	R08273
Chart Door (encl. seal)	R08002
GPM400 internal Fan Assembly	R08299
GPM400 Main Fan Assembly	R08300
SeaTalk NG Locking Collar (white)	A06051
GPM400 Install Pack	R08295

Keyboard spares	
Description	Part No.
Keyboard	
Sun cover	R08307
Rear cover / mounting bracket	R08308
Screw pack	R08309
Wireless upgrade kit	
Keyboard Charge Cable 2.5m	R08310
STNG Bulkhead Mounting Cable	R08311
Battery pack	R08312
Allen Head M3 Screws (4x)	R08313
Mounting Plate	R08314
Connector Cover	R08315
Mounting Screws (self tapping) 3x	R08316
Dust Cap	R08317
Allen key	R08338

GVM400 video module spares	
Description	Part No.
GVM Connector Cover	R08276
GVM install pack	R08318

SeaTalk^{hs} Switch module spares	
Description	Part No.
SeaTalk^{hs} Swtich	E55058

Index

Numerics

3rd party monitors 39

A

Accessories 117
AIS
  checks 88
  connection 53
Alarm
  cables 51
  connection 50
Alarm buzzer 29, 67
  installation 67
Alarm output 50
Audio
  cables 46
Audio output connection 46
Autopilot
  SeaTalk connection 50
AWG 36

B

Bearing alignment 84
Breaker
  rating 35
  sharing 34
Breakers
  turn on 70, 74

C

Cable
  audio 46
  charging 43
  digital radar 49
  gauge 36
  general instructions 32
  keyboard 42
  NMEA 0183 52
  power 35
  routing 32
  SeaTalk / alarm 51
  SeaTalkhs 47
  shielding 32
  strain relief 32
  types and length 32
Cable entry 58
Cables 31
  spares 117
  video/entertainment 46
Cables and connections 31
Cautions 7
Charging
  cable 43
  keyboard 64
Check system 70
Chinese 82
Circuit
  isolation 32
  protection 35
Cleaning 7
Clearances
  GPM400 60
Command Center Keyboard - see Keyboard
Commissioning 81
  introduction 13
Compass
  swing 82
Compass heading 82
Configuration 74
Connection
  digital radar 49
  DSM 48

keyboard 40
monitor 38
NMEA 2000 55
SeaTalkng 54
Connections 31, 37
Contents
pack 23
Current Master 76

D

Danish 82
Dashboard
cable 43
Data
digital data 89
troubleshooting 97
Digital radar
cables 49
connection 49
Digital sounder
connection 48
Disclaimer 9
Displays - See monitors
DSM400
connection 48
LED indications 100
Dutch 82
DVI 39, 46

E

EMC installation guidelines 7, 32
English (UK) 82
English (US) 82
Entertainment
cables 46
connections 43
Entertainment system 21
Environment
GPM400 60
keyboard 61
keyboard - wireless upgrade 62

F

Fastheading
connection 52
ferrites 8
Finnish 82
Fishfinder
checks 86
troubleshooting 98
French 82
Fuse 35
in-line 34

G

Gauge
cable 36
German 82
GPM400
checks 70
connections 37
installation 59
LED indications 99
master 37
pack items 24
power cable 36
Spares 118
specification 103
GPM400 processor 37
GPS
checks 85
connection 49
SeaTalk connection 50
status icon 85
troubleshooting 95
Greek 82
Grounding 34
GVM400

checks 70
installation 66
LED indications 100
Pack items 25
power cable 36
spares 119
specification 104
GVM400 Video Module 66

H

Handbook information 12
HDOP 86
High voltage
warning 7

I

Icelandic 82
Ignition hazards 58
Initial Setup 73
Initialize radar 83
In-line fuse 34
Install
introduction 12
Installation
warning 7
Installation and mounting 57
Instruments
SeaTalk connection 50
IP Address
monitor 39
Isolation 32
Italian 82

J

Japanese 82

K

Keyboard
assign 78
cables 42
checks 70
connections 40
dimensions 61
installation 60
pack items 26
spares 118
specification 105, 106
troubleshooting 93
wired 40, 41
wireless 41
wireless upgrade kit 27
Keyboard Configuration 78
Korean 82

L

Language setting 82
LEDs 98
Linearize the compass 82
Loads
circuit 35
Local GPM 76
Location
equipment 58
Loops
ground 34

M

Master GPM 37, 50
select 75
Monitor
3rd party 39
cables 39
checks 70
connections 38

power cable 36
repeat 38
Monitor connections 38
Monitors
assign to a nav station 77
installation 65
pack items 28
troubleshooting 92
Mounting 57
alarm buzzer 67
GPM400 60
GVM400 66
keyboard 61
surface 58

N

Nav Station 74
configure 77
typical arrangement 75
Navtex 88
Network
SeaTalkhs 47
Network system 19
NMEA 0183
cables 52
connections 51
GPS 49
set up 88
NMEA 2000 connections 55
Norwegian 82

P

Packs and contents 23
Parking
radar 85
Patch
cable 48
Plan your installation 12
Portuguese 82
Positive ground 7, 34
Power
cables 35
distribution 33
Power supply
SeaTalk / alarm output 50
Power up
test 70
Powering up 74
precautions 69, 74
sequence 70
Power-up
troubleshooting 92

R

Radar
cables 49
checks 84
connection 49
initialize 83
setup 83
troubleshooting 94
warning 7
Repeat monitors 38
Routing cables 32
Russian 82

S

Schematic diagram 12, 32, 73
example 109
SeaTalk
cables 51, 55
connection 50
GPS 49
SeaTalkhs
cables 47
compatible devices 47
connections 47
devices 47

LED indications 98
Switch 47
switch checks 70
video connection 43
SeaTalkhs network 47
SeaTalkhs Network cables 47
SeaTalkng
connections 54
keyboard connection 42
typical system 54
Wireless basestation 28
Select Master GPM 76
Setup
initial 73
Shielding 32
Site survey 65
Spanish 82
Spares 117
Specification 103
monitors 106
Status icon
GPS 85
Status LEDs 98
Status page
GPS 85
Strain relief 32
Sun covers 7
Suppression ferrites 8
S-Video
cable 46
Swedish 82
System
checks 70
System overview 16

T

Technical specification 103
Thermal breaker 35
Transmit
radar 83
Troubleshooting 91, 92
Typical systems 15

V

Ventilation 58
VGA 39, 46
Video
cables 46
connections 43
set up 87
troubleshooting 96
Video output connection 46

W

Warnings and cautions 5, 7
Warranty 8
WEEE 8
Wired keyboard 40
Wireless
keyboard 41
Wireless basestation 43, 64
installation 64
pack items 28
Wireless coverage 65
Wireless upgrade
installation 62
Wireless upgrade kit 62
pack items 27

Raymarine®

Raymarine plc
Anchorage Park, Portsmouth,
Hampshire, PO3 5TD, UK
Tel: +44 (0) 23 9269 3611
Fax: +44 (0) 23 9269 4642
www.raymarine.com

Raymarine Inc.
21 Manchester Street, Merrimack,
New Hampshire 03054 USA,
Tel: +1 603 881 5200
Fax: +1 603 864 4756
www.raymarine.com